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A Group of Lighthouses.

NO province in the vast field of structural design and execution is at once more special, and more interesting, than that in which the builder of the Lighthouse is called upon to exert his skill. Almost every problem which the architect has to solve has here to be met. The first consideration, under ordinary circumstances,—the choice of site,—is here usually determined by the imperative voice of necessity. It is not the site which is most imposing, most convenient, or most readily attainable, which is selected by the architect of the Lighthouse. It is, in nine cases out of ten, precisely that which is most dangerous and most inaccessible. No one would dream of building a lofty tower on a rock that was covered by the sea at every tide, and that lay twelve miles from the nearest shore, except for the all-sufficient reason that such a rock was a pregnant cause of fatal disaster, and required to be distinguished by a Pharos,—not to attract the sailor, but to warn him from its treacherous vicinity.

In calling the attention of our readers to a group of these noble structures* (which may be taken to be the architectural symbols of charity, in the true sense of the word, as being costly and efficient life-preservers), it is impossible to pass over the first on the list in point of time, as far as our own coasts are concerned, the Eddystone Lighthouse of Smeaton (G on our plate), although the story has often been told, and although this beautiful shaft will soon be replaced by another tower. "By the design and construction of the celebrated Eddystone Lighthouse in 1755-9," said Sir John Rennie in his exhaustive address to the Annual General Meeting of the Institution of Civil Engineers in 1846, "Smeaton introduced a new era in masonry, which forms a brilliant epoch in his valuable life, spent in the service of mankind, but more particularly for the benefit of his country."

The Eddystone, of which the name intimates the character, rises abruptly from a great depth of water, about ten miles from the shore, near Plymouth. The rock itself is a gneiss. On the last visit of inspection paid to it by Mr. Robert Stevenson (not Stephenson), the engineer to the Northern Lighthouse Board, in 1818, that able man noted that it was "shaken all through," and dips at a considerable angle, perhaps one in three, towards the south-west, and being undermined on the north-east side for several feet, it must be confessed that it has rather an alarming appearance. "I am not, however," continued Mr. Stevenson, "of opinion that it has altered its state since the date of the erection of the tower. Since my last visit in 1813 I am not aware of any change upon it. On the north-east side, however, at what is called the 'Gut' landing-place, where the men sheltered themselves from the fire of Rudyerd's Lighthouse, but especially at low water of spring-tides, there is a hollowing of the rock which penetrates at least to the circumference of the base of the lighthouse. I therefore conclude that when the sea runs high there is danger of this house being upset, after a lapse of time, when the sea and shingle have wrought away the rock to a greater extent. Nothing preserves this highly-important building but the hardness of the rock and the dip of the strata; but for how long a period this may remain no one can pretend to say."

On the rock of which we have thus cited the best extant description, a lighthouse was built, in 1696-9, by Winstanley. So confident was the architect of the strength of his work, that he often expressed his wish to be in the lighthouse during the heaviest storm that could assail it. This wish was accomplished on the 27th of November, 1703, when, during a night of terrific tempest, the structure and its inmates altogether disappeared. In 1706 a wooden lighthouse was erected on the same spot by Rudyerd, which was burnt in 1755. Smeaton was then applied to as to its replacement, and his "Narrative of the Building, and a Description of the Construction of the Eddystone Lighthouse; with an Appendix giving some Account of the Lighthouse upon the Spurn Point, built upon a Sand," in folio, and illustrated with plates, was published in 1791, and may, no doubt, be consulted at the British Museum.

The idea present to the mind of Smeaton was to follow the outline of such a forest-tree as most easily resisted the force of the wind, and to articulate together his masonry, so as to give his tower as far as possible the strength of a monolith. He cut in steps the surface of the rock, which was entirely covered by the sea at high water. He notched the risers of the steps, so as to form dovetailed mortises, into which the blocks of the lower courses were accurately fitted. Each block had a level bearing, and a border of live rock rose around the sunken base. The stones in each course were dovetailed together, and additionally secured by cramps or joggles. The successive courses were fastened to each other by similar means. Six courses, rising together 8 ft. 4 in., brought the work to a level surface. The eight succeeding courses were built solid, and from this level the tower rose as a hollow structure to the extreme height of 85 ft. 6 in.

The floors of the tower were constructed on the principle of the arch, the haunches being bound with chains, to prevent them moving outward, to the injury of the walls. In this structural method Mr. Smeaton is thought to have followed the example of Sir Christopher Wren, in the construction of the dome of St. Paul's; being limited in the size of the stones he would employ by the then state of the granite quarries of Cornwall. The work was completed in 421 working days, being finished on the 16th of October, 1757, according to one authority (but in 1759 according to Sir John Rennie). The light was originally a chandelier with twenty-four candles, which, in 1807, was replaced by a catoptric light, consisting of an Argand lamp with parabolic reflectors.

That a structure which was so wholly original, and which was erected under such disadvantageous circumstances as naturally attended on the exposed site, should have resisted the storms of the Atlantic as long and as well as has been the case with this noble work, must always be considered as incontrovertible evidence of the genius of Smeaton. In course of time the tremor of the building, with each wave stroke from the westward, more especially during a storm from the west-south-west, has become more and more alarming. The joints of the masonry have yielded to the heavy strains thrown on them, and the sea-water has been driven through them into the interior of the building. The upper part of the structure, according to a report from Mr. James Nicholas Douglass, the worthy successor of Mr. Robert Stevenson as our chief living authority on lighthouses, has been strengthened on two occasions, viz., in 1839 and again in 1865, with strong internal wrought-iron ties, extending from the lantern floor downwards to the solid portion of the tower. On the last occasion it was found that the chief mischief was caused by the upward stroke of the heavy seas acting on the projecting cornice under the lantern gallery, which lifted the portion of the building above this level. After reducing the projection of the cornice about 5 in., and well fastening the stones together with through bolts, no further leakage has occurred at this point. The tower is now in a fair state of efficiency, but the gneiss rock on which it stands, as anticipated by Mr. Stevenson, has been seriously shaken by the incessant sea strokes on the tower; and the rock is considerably undermined at its base. It has, therefore, been determined to erect a new tower on a spot which affords a good foundation, near low-water level, at about 127 ft. distant from the present site. The focal plane of the present lighthouse is at an elevation of 72 ft. above high water. That of the new building will be 130 ft. The actual useful range of the light, which is now about fourteen nautical miles, will thus be extended to seventeen miles and a half. On the completion of the new tower, it is intended to take down the present lighthouse to the level of the top of the solid work, 29 ft. above high water at spring tides.

The new tower will be constructed entirely of granite. It will have a cylindrical base, 44 ft. in diameter, and 22 ft. high, rising to 2 ft. 6 in. above high water springs. From this base will spring the shaft of the tower, the section of which will be a concave elliptic frustrum, the generating curve of which has a

* See p. 257.

major axis of 346 ft., and a minor axis of 74 ft. The diameter at the base will be 35 ft. 6 in., leaving around it a margin of 4 ft. 3 in. as a landing platform. The height will be 138 ft. above the rock to the top of the cornice, and the diameter of the tower, under the cornice, will be 18 ft. 6 in. The tower will be solid (with the exception of containing a water-tank) to the height of 25 ft. 6 in. above high-water springs. At this level will commence the side-walls, with a thickness of 8 ft. 6 in., diminishing to 2 ft. 3 in. at top. The tower will contain nine apartments, each 10 ft. in height, in addition to the lantern, the seven uppermost being 14 ft. in diameter. The whole of the work will be dovetailed and cemented, both horizontally and vertically, according to the system introduced by Mr. Stevenson, and adopted at the Hanois, Wolf, and Longships Rock Lighthouses. The total cubic contents of the granite masonry will be about 69,000 cubic feet, and the estimated cost is 78,000*l.*

Before proceeding to give some account of a lighthouse which forms a very striking contrast to the grand simplicity of the design by Smeaton, it may be instructive to put on record the several heights to which different engineers, in different situations, have carried the solid portion of their lighthouse towers. Mr. David Alan Stevenson, in a description of the Dhu Heartach Lighthouse, which is to be found in volume 46 of the Proceedings of the Institution of Civil Engineers, thus cites them:—

Name of Lighthouse.	Engineer.	Height of Solid above High Water.
Eddystone.....	Smeaton.....	10 ft. 3 in.
Bell Rock	R. Stevenson	14 „ 0 „
Wolf	J. Walker and J. N. Douglass	16 „ 4 „
Bishop	J. Walker	23 „ 0 „
Chickens	D. & T. Stevenson...	21 „ 0 „
Skerryvore ...	Alan Stevenson.....	30 „ 6 „
Dhu Heartach	D. & T. Stevenson...	64 „ 4 „

The most magnificent lighthouse of modern times is the Tour de Corduan, the upper part of which occupies the centre of our illustration. It is built on a rock at the mouth of the river Garonne, on which river, at a distance of seventy miles from its mouth, stand the important commercial city and port of Bordeaux. The tower was commenced in 1584, under the reign of King Henri II., and was completed in 1610, in the reign of King Henri IV. The architect was Louis de Foix.

The island rock on which this great Pharos is built is exposed only at low water, when an area of 3,000 ft. of rock in length, by half that dimension in width, is left dry by the tides of the Bay of Biscay. On this rocky area is provided a cylindrical base, 135 ft. in diameter, which is built solid up to 10 ft. above high-water mark, with the exception of a cistern in the middle, and an opening for the stairs, which rise from the high-water level. This opening is closed by heavy doors, and is reached by a ladder from the rock below, when the tide permits. The sides of this circular base have a batter of 5 ft.; and around the platform of 125 ft. diameter, thus arrived at, a wall is carried, 12 ft. thick at its base, and 12 ft. high.

On the centre of this circular area is erected the tower, which is 50 ft. in diameter at its base, and consists of successively diminishing stories. The lower story is Doric; the second and third, Ionic; the fourth, Corinthian; the fifth, Composite. The interior was handsomely decorated and furnished; the apartments of the first and second stories being fitted for storerooms, and for domestic use. The third story formed a chapel, 31 ft. in diameter, and having a dome 40 ft. high. Over this rose the Corinthian cupola, of 21 ft. in diameter, to the height of 27 ft. It had a stone balustrade around, and supported the lantern, which formed the summit, and which was 9 ft. in external diameter, 5 ft. within, and 17 ft. high. The total height of this Pharos is 182 ft. 6 in.

When the tower was first built the light used was that of blazing wood, which was burned on a cresset in the lantern. Coal was afterwards substituted. The smoke rose through an opening of 18 in. diameter in the dome of the lantern, passed into a finial chamber above, and escaped by side openings.

In 1727 the lantern was destroyed, and an iron one substituted by M. Betri. In 1780 the catoptric system of illumination was introduced by Borda, and an Argand burner was placed in the form of a parabolic reflector of silvered copper. In 1810 the dioptric system of Fresnel replaced the catoptric method. The Argand lamp now used in this and in other French lighthouses contains four concentric circular wicks, which are supplied by pumps with a constantly overflowing supply of oil.

One reason for the ornate character of this lighthouse is said to be that it was designed as a part of the projected chain of water communication to connect the Atlantic with the Mediterranean. This is actually effected, on a minor scale, by the canal of Languedoc, which is 150 miles long, and connects the Garonne with the Mediterranean.

In the year 1786 the Board of Northern Lighthouses was constituted by Act of Parliament. The preamble of the Act states that it would greatly conduce to the security of navigation and of fisheries, if four lighthouses were erected in the north part of Great Britain. In 1874, according to M. de Franqueville (whose work "Du Régime des Travaux Publics en Angleterre" gives a bird's-eye view of our public works such as is not extant in the English language), the number of lighthouses in Scotland was 153, over a coast line of 4,469 nautical miles. At the same date the Irish lighthouses were 109, for a coast line of 2,518 nautical miles; those of England 335, for a coast of 2,405 miles; and those of France, 346, over a coast line of 2,763 nautical miles in length. The annual cost of the maintenance of the lighthouses of the United Kingdom is given by the same writer at 440,000*l.*, while the light dues paid by the shipping amount to the sum of 520,000*l.* per annum.

No name is more deservedly distinguished, among the architects and builders of Lighthouses, than that of Mr. Robert Stevenson, the second Engineer of the Board of Northern Lighthouses. He succeeded his stepfather, Mr. Thomas Smith, in this appointment, in 1798, and his annual reports to the Board come down to the time of his resignation in 1843. The commencement of that great change in the safety of our Northern shores which is intimated by the above-cited figures may be said mainly to be attributable to the successful erection, by Mr. Stevenson, of the Bell Rock Lighthouse, which occupied the years 1807 to 1811.

The Inch Cape or Bell Rock lies off the East Coast of Scotland, abreast of the entrance of the Firth of Tay, at a distance of eleven miles from Arbroath, the nearest point of land. This dangerous rock, of which the name is so familiar to every student of Scottish ballad, is barely uncovered by the sea at low water. In December, 1799, occurred a dreadful storm, beating from the north-east on the Coast of Scotland, in which it was ascertained that no fewer than seventy sail of vessels were stranded or lost, with many of their crews, on that coast alone. Among these, the *York*, a 74-gun man-of-war, is believed to have struck on the Bell Rock. She went down with all hands, leaving no one to tell the tale. The coast for miles was strewn with the wreck. "There was now, therefore," says Mr. Stevenson in his memorandum on the subject, "but one voice. There must be a Lighthouse erected on the Bell Rock." It was not, however, until 1806, on a second application to Parliament, that a Bill was passed, chiefly on the evidence of Mr. Robert Stevenson and Mr. John Rennie, authorising the Commissioners of Northern Lighthouses to erect a Lighthouse on the Bell Rock after the design of Mr. Stevenson, at the estimated cost of 41,843*l.* 15*s.* The tower is the one marked I on our plate.

While taking the Eddystone tower to a certain extent as his model, Mr. Stevenson's design showed admirable originality in detail. He adopted a height of 100 ft., instead of 68 ft., for the masonry, and he carried the solid part of the tower to the height of 21 ft. above high water, instead of 10 ft. 6 in. He adopted a greater thickness for the walls, and he introduced important changes in the internal structure, by which he secured a greater continuity, and obtained greater strength, in the masonry of the floors and walls. Instead of the arched floors of Smeaton, Stevenson made each floor-stone form a part of the outward walls, extending inwards to a centre stone; independently of which they are connected with copper bats, with a view to preserve the square form at the extremity, instead of dovetailing. These stones are also modelled with joggles, sideways, upon the principle of the common floor, termed feathering in carpentry, and also with dovetailed joggles across the joints, where they form part of the outer wall. At Mylnefield quarry there was no difficulty in procuring stones of the requisite dimensions, and the engineer foresaw many advantages that would accrue from this change in the method of the structure.

The spring of 1807 was occupied in preparing a floating lighthaip to be moored off the rock, erecting the timber framework which was to support the barrack to be occupied as a temporary dwelling by the workmen, and carrying out other preliminary arrangements. During this season the aggregate time of low-water work, caught by snatches of an hour or two at a tide, amounted to no more than thirteen and a half days' work of ten hours each. The particulars are given in the interesting life of Mr. Stevenson, written by his son David. In this book, which is a worthy monument to his father's fame, Mr. David Stevenson has addressed the general, rather than the professional, reader. He has thus, while giving much interesting detail as to the extraordinary demands on the courage and perseverance of the engineer that were continually made in the course of a work of such difficulty and danger, given less than could be wished of structural detail, and has not even added to his biography a list of his father's works.

From the section, however, which he has given of the Bell Rock Lighthouse, we find that the diameter at the base is 42 ft.; that under the cornice, 15 ft.; the outline being an elliptical curve. The sill of the entrance-door is 30 ft. above the lowest through course of masonry; the height of the doorway is 7 ft. 6 in. This opening leads, through what is otherwise solid work, to a circular shaft of 7 ft. diameter and 14 ft. high, up which a winding staircase is carried. With that exception, the tower is solid to the top of this shaft, which is 34 ft. above the lowest course. Above this the walls taper from a thickness of 3 ft. 6 in. to one of 1 ft. 9 in., this part of the tower being divided into five apartments, each 10 ft. high, communicating with one another by staircases partitioned off from the rooms. Four of the through floors above described cover the four lowest of these rooms, and the fifth is covered by a masonry dome. The cornice projects 2 ft. 6 in. all round, and is surrounded on the top by an iron balustrade of a reticulated pattern. Within this stands the lantern, 24 ft. in extreme height. A lightning conductor rises above the finial of the dome-shaped top of the lantern, to the height of 26 ft. above the top of the cornice. The tower is pierced for lights for the three upper chambers.

In the year 1808 the foundation-pit was sunk in the solid rock, and was filled up with masonry to the surface level. The aggregate of all the time which it was found possible to work during that year was only 220 hours, so that little more than a month's working time was obtained during the first two years. In 1809 the wooden barrack for the workmen was completed, and the masonry was brought to a height of 17 ft. above high water of spring-tides. In 1810 the masonry of the tower was finished, and the lanterns fixed in place; and on February 1, 1811, the light was, for the first time, exhibited. The total height of the building measures 120 ft. on the section. It is usually called 115 ft., or 85 ft. above the sill of the entrance doorway.

We must defer to another opportunity any further remarks on the lighthouses of Mr. Stevenson. We have also to bring before our readers some account of that very different style of construction which has been adopted in the Red Sea, and in some other parts of the world, by the substitution of iron for stone as the material for lighthouse construction. In comparing the work of the lighthouse architect with that of any other builder, it must be borne in mind that, while the lofty towers of churches and of cathedrals are founded on pleasant plains, or on well-protected sites, those of the Pharos builder have to rest on a basis swept by the most tempestuous seas. While the force of the wind, or the drifting deluge of the storm, is the roughest test of the force of ordinary buildings (except when the fire of artillery is to be met), the lighthouse tower is exposed to the constant blows of heavy waves, and to the fury of seas that run up the slender shaft, and, unless thrown over by the cornices, dash themselves over the lantern at 100 ft. above high-water level. In the structure of the lighthouse, the lofty height of the most aërial towers has to be combined with the strength of the breakwater.

* Full particulars of Catoptric Lighting will be found in one of our earlier volumes, with a view of lantern and lighting apparatus. The lanterns and apparatus of several of the lighthouses shown in our present view were constructed by Messrs. Wilkins & Co.

ROYAL ACADEMY LECTURES ON ARCHITECTURE.*

BY PROFESSOR EDWARD M. BARRY, R.A.

SECOND PERIOD OF RENAISSANCE.—BRAMANTE AND SANSOVINO.

At the time of the death of Brunelleschi, in 1446, the Renaissance in architecture was an accomplished fact. The Italian architects had agreed to look for precedents to the remains of ancient Rome. We found Brunelleschi applying a taste, founded on such study, to the completion of a cathedral designed by a Gothic architect. Such an act tells its own tale of the Transition, which was then in progress. It was consummated in the time of the immediate successors of the great Florentine architect.

In the Duomo at Florence the old was merging gradually into the new, and the change was even more visible in principles of construction than in details of design. Brunelleschi's dome is pointed, but it is not Gothic; on the other hand, its details are few and simple, and can scarcely be held to confer a classical title.

While Brunelleschi was engaged at Florence, the Renaissance was making converts elsewhere, and the name of Leon Batista Alberti deserves a word of notice. Contemporary with Brunelleschi, he died soon after him in 1472, having previously designed some important buildings in the neo-Roman style, then fast coming into use. His case is the more interesting, as being typical of the Renaissance movement, arising from a general revival of interest in Classical literature. Alberti was well born and well educated, and his affection for the classics was so great, that he adopted Latin in his writings, and even in his conversation.

Turning his attention to architecture, he did his best, both by precept and example, to revive the ancient manner, and his church of St. Andrea at Mantua is interesting, as being one of the earliest of the Renaissance edifices. The design is one of much refinement, and the employment in it of Classical details is marked by a free spirit of adaptation, rather than by one of servile copying. The plan, by its cruciform arrangement, is consistent with Gothic tradition, while the semicircular arched roof, and the crowning dome, illustrate the style, which was now asserting its claims to rule the architecture of Italy. The treatment of the aisles, or rather their suppression, in favour of chapels, rendered it possible for the architect to adopt a simple system of vaulting, recalling the designs of the great Roman baths. The same may be said of the ornamentation of the decorative portions, which is more suited to a secular building than to a church. The design has the merit of consistency, as a work of art, although we may refuse to it that of fitness,—a no less essential condition of satisfactory architecture.

It deserves remark that the Renaissance was based throughout on Roman ideas. The beauties of Greek architecture were a sealed book to the Italians till long afterwards. Roman art was at their doors; it was the work of those whom they claimed as ancestors. It was like a relative at the gate knocking for admission. It is matter for regret that this was so. If the great men of the Early Renaissance had been acquainted with the pure and noble architecture of Greece, from which their favourite Roman style had been evolved, their work must have gained both in truth and refinement. In this respect modern architects have not the same excuse, if they fail to benefit by the knowledge now placed at their disposal.

The early examples of the new style encouraged the hope that, in hands like those of Alberti, a free development might result, so that architectural art might take a new departure, based upon existing Classical forms. This hope was only partially realised, and, at last, the pedantic rules of the later architects placed correctness of precedent before every essential artistic principle.

In modern practice, if the architect is to claim the title of professor of a reasonable calling, it is impossible that he should bind himself absolutely by tradition. He must learn to use his art with freedom, and there is little wisdom in an arbitrary selection of a special period of historical art, if he is to seek to bend the wants of to-day to its rigid forms, rather than adapt and modify the latter to satisfy the requirements of his own time. The enthusiastic temper of revivals is not always favourable to the calmer maxims of common-sense; but, nevertheless, our architecture, if it is to be more than a passing fashion, ought to be ruled by the latter.

In Italy, at this period, enthusiasm carried all before it, and the direct imitation of Roman buildings, even to their faults, became common. At Rome, the Popes caught the infection, and all were in haste to realise the promised glories of the new style. The re-building of St. Peter's became an epoch in art, and, to this day, its effects are visible. It might have been supposed that, at Rome, if anywhere in the world, and by the Popes if by any persons, the preservation of ancient buildings would have been religiously insisted on. Such a spirit is, however, rarely to be detected in architectural history. Men might be, and indeed were, so influenced by old associations, or prejudices, that their work was unconsciously affected by them; but a deliberate preference for old things, because they were old, was as rare with our Mediæval forefathers, as with the art-reforming Popes of the Renaissance. A sublime confidence led both the one and the other to remove, without scruple, the works of their predecessors, that they might substitute their own. We have learned to be more diffident, and as we have not been able to agree on a school of architecture, to whose dictates all must bow, our love for ancient work, and desire for its preservation, are both right and logical. It is, of course, possible to press such sentiments too far, till they become burdensome, and provoke reaction, and the question is, as you know, one on which controversy is always busy.

However we may decide in the nineteenth century, conservatism in art was not the rule in Rome at the time of which we are treating. The old and venerable basilica of St. Peter was neglected and tottering to its fall. Erected in the age of Constantine, and reputed to mark the place of the martyrdom of St. Peter, it had, we might suppose, a special claim on the reverence of the faithful. Of magnificent dimensions, it could not be accused of deficient accommodation. Although the exterior might have been deficient in architectural dignity, the same could hardly have been said of its internal effect, with its double aisles, and their long vista of columns. Those who have seen the basilica of St. Paul, without the walls, at Rome, will be able to realise somewhat of the effect of old St. Peter's.

Restoration, or preservation, would have been the course to be adopted, according to our judgment of such things now; but this was not the view of the Popes or their advisers. Everything must be changed. The basilica, however venerable, had an incurable fault, which many of us have, and all are contracting. It was old, and it was getting older. It must go, and in its place must rise a new St. Peter's, a wonder of the world, the greatest and most splendid church which had ever been seen.

Such was the decision of the Papal Court, and when Julius II. was raised to the pontifical chair, he eagerly sought for an architect imbued with his own taste, energy, and enthusiasm. He found such a man in Bramante, who was born just as Brunelleschi died, and on whom the mantle of the latter seemed to have fallen.

Born of poor parents, he soon displayed a taste for drawing, and was encouraged by his friends to become a painter. Finding architecture more to his taste, he travelled, first in North Italy, to inspect the architecture of that district, and then turned his steps to Rome. Here, like Brunelleschi, he was fascinated by the ruined monuments of the ancient city, and set himself to work to measure and study them with labour and research. He thus acquired, not only accurate general ideas, but also a knowledge of details, such as mouldings, consoles, vaultings, &c., which no one had hitherto possessed, so that Michelangelo subsequently declared that no one had yet excelled Bramante. It is unfortunate that we have not fuller materials for estimating his talents; for, even at St. Peter's, very little of Bramante's work remains. He was largely employed by Pope Alexander VI., as well as by Julius II., at the Vatican. The Palace of the Cancellaria was partly designed by him, and is remarkable for refinement of detail. We find in it no signs of that worship of bigness which was to triumph at St. Peter's after Bramante's death, but, on the contrary, the parts are small, and perhaps even over-minute. The introduction of pilasters in the two upper stories, a common expedient of Renaissance architects, has met with criticism, and it may be admitted that it is open to question both in this example and elsewhere.

At the Cancellaria, the pilasters are too much scattered over the surface of the elevation, and are not happily grouped. Their smallness of parts is also inconsistent with the plain, and even severe, character of the rusticated basement, and though well proportioned in themselves, they appear unsatisfactory, because out of place. Another work of Bramante was the Belvedere Court of the Vatican. Owing, it is said, to undue haste in building, the few remains of the design have been so much altered that no opinion of the original effect can now be formed, while most of Bramante's work has been removed in consequence of alterations and extensions of the Vatican. Bramante did not leave behind him the reputation of a good constructor. His building operations were hurriedly conducted, and in such matters the Italian maxim of, "Chi va piano, va sano," holds good. When architects are criticised, it is often forgotten that they are commonly pressed to complete their works in too short a time. Bramante committed an error of this kind, and his work, even at St. Peter's suffered in consequence. In his designs generally, the exuberance of the Early Renaissance became chastened or controlled by a more severe taste, and luxuriance of detail gave way to a grandeur of style.

When summoned by the Pope to advise on the rebuilding of St. Peter's, Bramante was prepared for the occasion, and submitted a plan of great size and pretension. The arrangement was that of a Latin cross, with five bays of nave arches, and three tribunes for choir and transepts. A dome marked the intersection of nave and transepts. The principal tribune, which is at the west, instead of the eastern end of the church, was erected before the appointment of Bramante, from the designs of Rosselini, by order of Pope Nicholas V. This tribune was retained by all the other architects who were afterwards engaged upon St. Peter's. In his early travels, Bramante had been much impressed by the cathedral at Milan, and had conferred with those who had the direction of the works. This building had a German origin, and exhibits many of the peculiarities of a Northern Gothic design. The influence it had gained over Bramante's mind is to be traced in his plan for St. Peter's, which resembles the design of a northern cathedral, in its division into nave, aisles, choir, and transepts. The semicircular terminations of the latter were due to the previous existence of the Western tribune.

There is a general disposition, from Bramante's great reputation, to credit him with a good design for the exterior of St. Peter's. It may doubtless be assumed, from his work at the Cancellaria Palace, that he avoided the error of the gigantic order which has been adopted in the existing building. Indeed, the pilasters indicated in the plan ascribed to Bramante, are of small dimensions. It was his misfortune, however, to leave behind him few illustrations of his proposals, and we are, consequently, left very much to conjecture. At Bramante's death, in 1514, the work had not far advanced. Raffaelle and Peruzzi followed him as architects, and passed away in rapid succession, after which the work was entrusted to Antonio San Gallo. The design of this artist is preserved, and it is probable that it was based, more or less, upon the proposals of Bramante, modified by his own views.

Bramante's plan is of too vague a nature to explain the details of his design; but from his ordinary practice some notion may probably be formed of the manner in which he would have treated the exterior of St. Peter's. The general arrangement of his plan gives, in the first place, a greater number of piers, and arches, pilasters, niches, and other details, than we find in the existing building. The slight projections indicate the intended employment of a small order in place of the great columns and pilasters subsequently erected. Bramante seems to have been fully aware of the advantage of scale in a design, and knew that a mere magnifying of details was not enough to produce a grand building. Both in his church at Lodi, and in the dome which he added to the church of Sta. Maria delle Grazie, at Milan, he placed columns over columns, rather than resort to the dangerous expedient of a large single order. We may presume, therefore, that he would have carried out

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* Fifth Lecture. See p. 219, *ante*.

similar principles at St. Peter's, and that the building, in his hands, would have at once impressed the visitor with its vastness, instead of that result being only reached, if reached at all, as at present, by a process of reasoning and comparative observation.

San Gallo's design was evidently based on Bramante's principles, carried possibly to extremes. After the death of the latter, the Renaissance architects seem to have sought simplicity in exaggeration. Nothing was too large, and scale and refinement were lost in the vulgarity of mere size. It is at this point that the Renaissance lost much of its charm, and even the genius of Michelangelo fails to reconcile us to the change. Notwithstanding such divergence of principle, however, Michelangelo had a genuine admiration for Bramante. He wrote "that Bramante was equal to any architect who has appeared from the time of the ancients to our own can by no means be denied. The first stone of St. Peter's was laid by him, not after an obscure or confused plan, but in accordance with a design which was clear, comprehensive, and luminous; he had, besides, so isolated the church that it was in no respect detrimental to the Palace, and those who have departed from the plans of Bramante, as San Gallo has done, have, in so far, departed from the truth." He further denounced severely the design of San Gallo, not in respect of its details, which present many points of criticism, but on the ground of the multiplicity of features. He declared that "it was broken into too many parts, and with an infinity of columns, would convey the idea of a Gothic building rather than of an antique or classical one."

In this censure we have a key to the artistic feeling of the time. The period of copying had set in. Any lingering love for the Gothic style was to be cast out; the Transition, with its attempts at fusion, was over; and every building was to be, more or less, directly imitated from the antique remains. The five orders became the rule for the future, and the great difficulty of Renaissance architecture has always since been in the right use of columns. If they are too few, and large, they injure the scale of the building, as at St. Peter's; if they are too numerous, and small, they produce a pettiness of effect, as in San Gallo's design. In the first case, they arouse the same feelings which are excited by colossal statues, with their exaggerated features. In the second, they tend to confusion, and the loss of simplicity of general effect.

Michelangelo's assertion of the quasi-Gothic appearance of San Gallo's design was not unfounded, although it was, in truth, less uncomplimentary than he intended. One of the greatest merits of the Mediæval architects is to be found in their realisation of scale. They delighted in the use of small parts, frequently repeated. Moulding upon moulding, arch beyond arch, and piers in long ranges, give an idea of size, and charm of perspective, in many a humbler edifice than St. Peter's, which the latter cannot rival.

Bramante was clearly right in his preference for orders of a moderate size, and his introduction of them into his buildings, already referred to, may be studied with advantage. It may, I think, be concluded that he would not have raised the dome far above the rest of the building. A great admirer of the Pantheon, he intended the dome of the Basilica to be of the same design and dimensions, and the boast afterwards attributed to Michelangelo, that he would raise the dome of the Pantheon into the air, probably referred to the less altitude proposed by Bramante. San Gallo had already adopted the principle of height when Michelangelo criticised his design; but this took place long after Bramante's death, when the whole question of finishing St. Peter's was in a state of chaos, and his original designs already obsolete. They were, then, probably, indeed, regarded with some disfavour, for, owing to the indisciplined zeal of Pope Julius, the work executed in haste by Bramante was already showing signs of weakness and incipient decay. We may perhaps suspect that such a discovery was not unwelcome to those who already contemplated the erection of a dome more lofty and weighty than Bramante intended. The piers which he erected were evidently not designed to support so great a burden, and the hypothesis that he wished to repeat the more moderate design of the Pantheon, is thus strengthened. Beautiful as the present dome of St. Peter's may be, it is to be regretted that Bramante had no opportunity of carrying out his design, or some similar design, on a grand scale. The fault of St. Peter's is its great altitude in proportion to the width, the dome being two diameters and a half high. The Pantheon has a height of only one diameter, a proportion undoubtedly more favourable for internal effect.

The time of Bramante has always been considered the best period of the Renaissance, and he occupied the foremost place among the architects of the new faith. His early training as well as his later convictions led him to appreciate beauty of detail, as well as greatness of conception. Familiar with the works of the Lombard architects of North Italy, and the employment, by them, of small clustered shafts, he was not tempted by the comparatively colossal dimensions of the old Roman columns. Although full of Classic feeling, and even prejudices, he yielded but little to the temptation of actual copying, and his designs show an attempt to adapt the style to the requirements of his day, which is the only reasonable justification of a revival. His designs appear to have been based, as regards conception, on the simplest and most noble forms, such as the Pantheon; and as regards details, on the architecture of the Roman theatre, with its numerous features of small niches, pilasters, and ornaments, all of them susceptible of elaborate treatment in their decoration.

After the time of Bramante and his contemporaries, the Renaissance entered into a new phase, less satisfactory and artistic; and it has thus happened that many persons have passed a wholesale condemnation on the entire movement, and have been blind to the merits of Bramante and other artists, who worked for the same ends, and at the same time. One of the most famous of the latter was Sansovino, who had begun palace-building at Venice, while Bramante was engaged at Rome in carrying out the Pope's dream of a Christian temple which should surpass every building of ancient or modern times.

The Renaissance appears to special advantage in Venice. It seems to have been more easily adapted to secular than to sacred purposes, and the palaces of Sansovino and his brother architects rival their predecessors. Being isolated from Rome, politically, no less than by reason of distance, the Venetians had less knowledge of the antique, and were more free in their treatment of Classical precedents than other Italian revivalists. They were also already in presence of noble Gothic buildings which might well excite their emulation, while in their semi-Classic adoption of the horizontal principle, such buildings seemed to lead the way to fusion rather than to forbid change. The Transitional period of the Renaissance lasted longer in Venice than elsewhere, and the non-Gothic portion of the Ducal Palace, namely, the north-eastern angle of the court-yard, was not completed until the middle of the sixteenth century. In the design of this work, semi-circular and pointed arches appear in the same composition, with pseudo-Classical pilasters, and clustered shafts of Gothic origin. The general effect recalls the unchastened richness of the Certosa, and the sculpture is profusely distributed over the surface of the elevation. The execution of the latter is good, and the whole presents a not unsuccessful attempt at the treatment of an internal court; though, for an important exterior elevation, there is too little dignity of general conception, and too much confusion of detail.

The later palaces of Venice exhibit Classical details, adopted more extensively, and applied less intelligently; for too many of their façades are mere frontispieces, to which are attached columns and pilasters, which serve the purpose of mere decoration. Thus at the Grimani Palace we find no less than three orders employed. This building has many admirers, but I do not consider it an undoubted success. The treatment of the three stories is monotonous, and the proportions of the openings ungraceful, and not consistent with each other. The columns and entablatures seem to be built up against the front, without forming part of it; while a definite design of the actual wall is interrupted by the orders, so that the effect is that of a completely designed building of plain character, seen through an intervening screen of columns, interposed for ornament only.

The Casa Grimani, however, has many merits, and the details of the various orders, the delicacy and finish of the ornaments, and the dignity and solidity of the general effect, deserve the admiration they have received. Not the least of its good points is that it is placed upon a good and solid basement, and thus seems to stand, as it were, upon a rock among the waters.

A design which is, to a great extent, free from the objections above mentioned, is to be seen in the Palazzo Camerlinghi, near the Rialto. This, although only a small façade, is a pleasing example of the use of Classic details, without a wholesale reproduction of an order and all its parts. There is here an absence of the duplex system of design complained of at the Grimani. The pilasters employed take the character of piers, forming part of the wall, which they strengthen. They have, moreover, an effect of their own, and do not repeat, too literally, the details of a regular order. They are, in fact, panelled piers rather than pilasters, and it is evident that such a design gives scope for an artistic treatment of the panels beyond that which has been adopted. The openings are designed in a manner which recalls the earliest Renaissance examples, being of proportions more usually seen in Gothic, than in Renaissance buildings. The details of the window jambs are small and delicate, and the grouping of the whole with the central window, of two lights, separated by a mullion, is agreeable and suggestive. On the other hand, the windows are too high for their width, and the whole elevation presents a somewhat cramped appearance, and would gain greatly by lateral extension. The lower story is the least satisfactory portion. The adoption of panelled pilasters here, as well as above, gives it an insipid character, marked by too much sameness. The details are, moreover, too fine and delicate for the rough usage which an entrance must expect, particularly from the gondoliers at Venice. The large arch over the doorway does not appear consistent with the smaller arches of the windows on either side, and there is no correspondence in the line of springing. It would have been better, if the pilasters of this story had been omitted, and a plainer treatment adopted, with rustications, and a bolder character of design given to the doorway as in Florentine work. A projecting balcony on the first floor would properly have crowned such a story, while correcting the exaggerated length of the windows of the first floor. Taken altogether, however, this unpretending example well deserves attention from architects, who, like ourselves, are often called upon to design buildings in places such as London and other large towns, where land is too valuable to allow us much wealth of space; and light is of such importance that we are compelled to obtain as much window area as possible.

The most important of the Renaissance palaces is the great work of Sansovino, the Library of St. Mark, which I described on a former occasion. Placed exactly opposite to the Ducal Palace, it challenges a somewhat unequal comparison. On architectural grounds alone the Library may well hold its own, but the interest men feel and express in the Ducal Palace is not purely architectural. The latter building is connected with the distant past, by associations which are full of romance, mystery, and interest. Sansovino's work stands before us, on its merits alone, as a work of yesterday; about which everything is known, and which has not had time to grow venerable. It was designed for modern use, and appeals to modern ideas.

We have here, in one spot, champions of the rival styles of Gothic, and the Renaissance,—of the old and the new. We have been told that the latter must be pronounced inferior, because artists do not sketch its parts, and fill their commonplace books with its details. If this be so, we must not forget that men do not regard such matters, apart from historical associations, and it may be remarked that while no one has proposed to copy for modern use the Ducal Palace, the Library of Sansovino has found many imitators. The effect of the latter design, as a whole, is certainly very good. The orders of columns are well proportioned and detailed; and the small window columns in the upper story are skilfully introduced, so as to give scale to the larger order. The proportions of the arches recall Roman precedents, and contrast agreeably with the elongated types used in the Camerlinghi Palace.

Sansovino was a sculptor as well as an architect, and it is probably to this circumstance that the profuse ornamentation of the

design is due. Greater restraint would perhaps have been better, and partial suppression would have added to the value of the remainder. At the same time, the sculpture itself is well designed and executed, and we feel we must take the design as it is, and regard it as a whole. It is certainly one of the best of the Renaissance palaces, and though it is doubtless liable to the charge of imitation of the Roman orders, if that be admitted to be a defect, it must be confessed that very few architects of more recent times can afford to throw stones at Sansovino. It may perhaps be worth while for some architectural critics to consider how far such reproduction of ancient details is, of itself, an unpardonable defect, and how far it is a special reproach to the Renaissance.

That mere unintelligent and wholesale copying is to be reprobated, must, of course, be granted *in limine*; but, unless we are to have that dream of enthusiasts, an original style, perfect in all its parts, recourse must be had to precedents. A Gothic shaft, with Early English foliage, affixed to a wall, is as much a reproduction, and an applied ornament, as a Doric three-quarter column or pilaster, treated in the same way. The former has often, indeed, the less constructional justification; for, while the Classical column strengthens the wall, and forms a part of it, while being built, its Gothic rival is, in many cases, a mere piece of added decoration unnecessary to the structure, and not placed in position until the building has been finished.

We *must* use the old styles, though it should be our aim to adapt them to modern use. With the traditional styles, certain details have come to be so intimately associated that the absence of them, or their indiscriminate association with other forms, shocks us, like a false quantity in poetry, or a *lapsus linguæ* in speech. Any fusion of diverse architectural schools is consequently a task of the greatest difficulty, needing severe restraint, great caution, and abundant knowledge. The architectural student requires to be on his guard in this respect. Our fashions of public taste change so rapidly that in search of novelty he may be tempted to snatch at a fleeting popularity, by forgetting the sound principles on which architecture should rest; and may allow himself to believe that a general hotch-potch of features, taken indiscriminately from the monuments of the past, is to be the style of the future.

This is sometimes thought to be a right use of freedom, and is miscalled "Originality," when it rather merits the name of "Carelessness." It is an offshoot of the same spirit, which seeks to attain a so-called picturesqueness of plan by throwing the parts together at haphazard, with little attempt at arrangement, and less thought. It has been well said by Sir Joshua Reynolds, if such a system of composition, or rather neglect of all principles of composition, that "simplicity, when so inartificial as to seem to evade the difficulties of art, is a very suspicious virtue." If a laboured system of symmetry be displeasing, what can be said of artificially-devised irregularities not justified by the circumstances of the particular case?

The Renaissance architects have been much censured in modern times for the regularity of their designs, but in a compound art like architecture, which demands scientific treatment, the presumption must be in favour of regularity in buildings of importance. It is not only the Parthenon, or the Renaissance palaces, which accept this principle: it is found admitted in practice in the best remains of Mediæval architecture. What can be more symmetrical than the plan of any great cathedral with aisle balancing aisle, transept corresponding with transept, sometimes tower with tower? Although a skilful architect will decline to be controlled by an absolute symmetrical law, he will always remember that symmetry appeals to a natural instinct, and that good reasons should exist, if it is to be disregarded, in his designs.

The early works of the Renaissance are full of variety, and gave picturesqueness at the expense of dignity. The later examples reversed the process, and have been complained of for cold correctness, without interest. This may doubtless be urged, with truth, against some of the buildings erected in the decadence of the movement; but, as it seems to me, it does not fairly apply to the designs we have just now been considering. Sansovino's Library is certainly not more, but less, regular and monotonous, in general design, than the Ducal Palace; and there is even too much variation of detail in the small façade of the Camerlinghi Palace.

The aim of the architect should be to apply the knowledge he possesses, with intelligence, consistency, and beauty. He need not be too much afraid of the cry for novelty. If the Renaissance architects have failed in their attempt to reconcile the antique with the modern, no appeal to authorities will save their work from condemnation, and their principles from neglect. On the other hand, if they succeeded in proving that the old architecture of Greece and Rome was capable of a development which should meet the altered circumstances of modern society, the accusation of copyism will not destroy their influence.

While I advise the young student of architecture to make the most of his opportunities of studying the various forms his art has assumed in the past, I do not for a moment say that he should copy all he sees. He is to gather facts from the experience of others; he is to use his knowledge to improve his taste. Let him by all means choose his own line, and attach himself to whatever school of practice he deliberately prefers. When he has done so, he should study it in all its parts and varieties, and he may depend upon it he will find that originality springs best from knowledge. Novelty is always easy, if the restraints of good taste are laid aside, and eccentricity in society is a poor substitute for good breeding.

The actual forms of architecture obviously do not admit of indefinite variation. The possible curves of an arch, or shapes of openings, are soon exhausted. These things are as the grammar of our art, or perhaps, more correctly, the language in which architecture expresses her ideas. It is as to such matters, that we need not be afraid of following precedents. None are so clever that they can afford to neglect the stored experience of the world, and when we occasionally see some nondescript design, and are asked at least to admire its originality, we seem to remember a saying we have heard, that "fools rush in where angels fear to tread." If the modern architect think properly of the purposes for which his buildings are intended, it is scarcely possible that he can be a literal copyist, while, as to the rest, it is better to copy good details, than to invent bad ones.

The circumstances of each age are so different that an architecture which really serves its needs can scarcely fail to have a special character stamped upon it. Here is scope for the originality of genius,—originality not of this or that detail,—not an originality which sets at defiance the hard-won experience of centuries,—but an originality of conception, application, and general treatment,—the skill which seizes on the knowledge of the past, to apply it to the wants of the present,—the conviction that the inmost wants and aspirations of man are and have been ever the same,—"that the thing that hath been, it is that which shall be,—and there is no new thing under the sun."

We have seen, in our past review of architectural history, that while Gothic art cherished the vertical principle, the Classic architects, and, following them, the Renaissance revivalists, adopted horizontalism as the ruling idea of their designs.

In ornamentation, the conflict has been between the natural and the conventional, not so much in the minor architectural details, such as capitals, cornices, &c., as in respect of the application of the higher artistic development of sculpture and painting. While men have cherished the old eccentricities of detail in their churches, the artists of the Renaissance went direct to Nature for inspiration. The old Greek worship of beauty became again with them a passion, and their saints recalled the gods and goddesses of old, by their idealisations of human perfections. To the Mediæval spirit such ideas were abhorrent, a danger to the believer, a snare to all who encouraged them. If sculpture could be admitted to the sanctuary, it must be of a special character, prescribed by conventional religious rules, which ignored, as much as possible, the human element. The painter and the sculptor might dwell in an ideal sphere, peopled with saints and martyrs, but a frank reference to actual facts was forbidden to them. They might wander in clerical pastures, guided by ecclesiastical leading strings, but they must not go beyond. The free air, the open sky, the world in all its wondrous beauty, was not for them; they must not gather from these a spontaneous inspiration; they could not be trusted to look through Nature, up to Nature's God.

In as far as the Renaissance constituted a protest against such conclusions, we may be sure it will not be reversed. Freedom once tasted is never willingly relinquished, and an artist without freedom is at best a strong man in chains. Our architecture must welcome the best art of its time; and if we expect painters and sculptors to do their best in co-operation with ourselves, we must see that they are afforded free scope for the exercise of their genius.

In determining the style of our architecture, such considerations should have weight. We must inquire not only into its special historical and æsthetic merits, but as to its adaptability to modern requirements, not forgetting its flexibility with reference to the assimilation of the sister arts.

The student will find much to reflect upon in such questions. Let him think them out for himself by the light which reason and history afford him; let him bear in mind that he has to work for the present, and not dream only of the past; and especially let him remember that an architect must possess, in addition to good taste, sound judgment, and common sense; not only as to the ends he has in view, but also in respect of the choice of a style, as the means to such ends.

CHOICE EDITIONS OF ARTISTIC WORKS.

One of those brilliant American correspondents, who write history for the *New York Times* or the *Evening Post*, narrated last winter how one evening in Paris he saw at a reception a distinguished London publisher seated in a corner apparently in great dejection; on being asked what afflicted him, he replied, "I have been making one of my periodical visits of inspection among the publishing houses here; and I must say that it is quite heartbreaking to see what a mass of fine books these Frenchmen turn out in the course of a year. And so richly illustrated and bound, too! There is no approach to it in England, and it seems to me that that is enough to make one sad."

What the state of that justly sensitive gentleman must be at the present season it is painful to reflect upon, when we consider the promise that one Parisian publisher alone makes us of forthcoming works.

France, the home of the Elzevirs and the Étiennes, the cradle of the Plantins, may be said to be the land of choice editions. Even in the last century the inferior writers, such as Dorat, insured a ready sale for their now forgotten works, by employing as illustrators, Eisen, Cochin, Gravelot, Choffart, Wille, Schmidt, Marillier, Mareau, and many other artists, the beauty of whose works has remained for four generations unappreciated.

More than one bibliopole, not alone in France but in England, will point with sad regret to the fox-marks on the glazed paper of the choice editions of Curmer, published in the days of his youth, at the height of the French romantic school, on which English literature and English art exercised at the time so powerful an influence.

The first successful efforts made in the direction of the publication of choice editions in France may be said to reach back some twenty-five years or so, when Jannet commenced his "Bibliothèque Elzevirienne," and Perrin, of Lyons, delighted bibliopoles with his tinted paper and reproduction of sixteenth-century capital letters and *culs de lampe*; and these traditions are now worthily carried on by the well-known firms of Alphonze Lemerre and M. Jouast, whose delightful little volumes charm us each season as they appear.

The announcements of the forthcoming works of one of these publishers, M. Quantin, the head of the well-known firm of Claye, is certainly attractive. Here we have promised, among other interesting literary and artistic treats, the "Letters of Eugène Delacroix," 1815—1863, collected, put in order, and published by the indefatigable care of M. Philippe Burty,—letters furnishing a mass of novel information on the life and works of the famous head of the French romantic school, upon his early struggles, his travels, his pictures, his intimate friends, the famous personages in the world of art and letters of the period in which he lived.

There are no less than 330 letters, all of which are interesting; a portrait, engraved in

mezzotint, under the direction of Delacroix himself, and from a picture by him, showing us the painter of the famous "Dante and Virgil in Purgatory," in the characteristic costume of the Restoration. Some ten *fac-simile* autographs show his writing at different periods of his life from 1815, when he was still at school, till 1862, the year which preceded his death. An addition, which every one would wish to see, were it possible, in the biographies of famous painters, is the chromo-lithographed reproduction (in no less than forty tones) of three of Delacroix's palettes,—that which he used when he came from the *atelier* of Guerin, the Benjamin West, one might almost say, of France; the palette he used for his well-known picture, now in the Louvre, of the "Massacres at Scio," and the palette he worked with in the decoration of the Salon de la Paix at the now no longer existing Hôtel de Ville. These letters form a work that will interest all art-lovers in England who remember the Delacroix of the magnificent collection shown some years ago by Sir Richard Wallace at Bethnal-green.

Suffice it to mention among the other features of M. Quantin's catalogue, "Researches on the Jeweller's Art in Spain," by the Baron Ch. Davillier, illustrated with numerous etchings, and to appear this month, as also the same author's "Notes on Cordova Leather"; M. Bonaffé's "Inventory of the Duchesse de Valentinois"; M. Vidal's "Stringed Instruments," with 180 etchings; the "Imitation de Jesus Christ," literally, as it is stated to be, a "*publication d'amateur*," illustrated with ten compositions by Paul J. Laurens, etched by Leop. Flameng, and the "Renaissance in France," by Léon Palustre, to appear in parts, and when finished to form three volumes in 4to, all works which, in their artistic perfection, are calculated to delight the amateur, and yet of a nature so practical that the mechanic or the professional man cannot fail to be at a disadvantage, who is not either in possession of them, or who has not read them.

But the *pièce de résistance* of M. Quantin's catalogue is the superb work on "Hans Holbein," by Paul Mantz. The object of the publisher in producing this volume is to inaugurate a series of monographs on the great artists of all countries and all epochs, and containing not alone faithful reproductions of their finest works, but a careful study of their methods and their lives; an enlargement, in fact, of M. Charles Blanc's "History of Painting." The series is commenced with Hans Holbein, the indefatigable draughtsman whose genius has left such traditions in Switzerland, Germany, and England. M. Paul Mantz describes the life, till this time almost unknown, of Hans Holbein, and the author has not confined himself to putting in order the various documents found in the archives; he shows us Holbein in the noble period in which he lived, now working for the printers at Bâle, or beautifying with his brush the walls of the rich Swiss burghers' houses, now illustrating the works of Erasmus or Sir Thomas More, and eventually becoming the court painter of Henry VIII. The lost works are referred to, as also those that still exist, and passing through the principal galleries of Europe, we see the successive evolutions of Holbein's talent.

Such a work, it can be understood, affords a rich field for illustration. Aided by the counsels of M. Edouard Lièvre, the author of the "Musée Universel," some of the finest drawings and pictures at Bâle, at Windsor Castle, at Darmstadt, at the Hague, Berlin, and Dresden, and the Louvre, are reproduced. Here we see the Bible illustrations,—the "Dance of Death," the old editions of which are now almost impossible to find. The volume comprises in addition a certain number of etchings, among which are the Erasmus of the Louvre (once in the collection of Charles I.), the costumes of the Bâloises, the series of drawings of the "Passion," and the portrait of Holbein's wife.

In one volume it was impossible to bring together all the works of so industrious an artist, and more than one omission must be regretted; but no work yet produced on Hans Holbein gives so complete an idea of the varied powers of one of the greatest masters of the Renaissance.

Nothing can exceed the care with which the edition has been prepared, and the heart of the most ardent follower of Dibdin cannot fail to expand as he reads the "*Justification du tirage.*a "No. 1 on vellum, Nos. 2—6, text, on extr" strong Japan paper, plates before letters on Japan paper, in black; on Whatman's, in red, on Dutch with letter"; and so on. The text consists of some 200 pages, illustrated with twenty-seven separate engravings, of which twenty-six are etchings; the other illustrations, woodcuts, and photo-gravures number more than 300. Each year, and even oftener, M. Quantin promises to produce in the same careful manner the works of some famous master.

Such an announcement should make our London publishers "look to their laurels." Who can fail to remember with pleasure, constantly recalled by Mr. Parsons's inviting catalogue, the superb edition of Chamberlayne's "Holbein," with its choice *fac-similes* by Bartolozzi from the drawings which Queen Caroline, as Walpole tells us, found in a bureau at Kensington Palace?

What treasures have we not in England of the same nature that might be reproduced;* say, for example, the truthful portraits by John Payne, the even more exquisite portraits in three colours, by Faithorne, which surpass, perhaps, the works of his master, Nanteuil, the stately portraits of George Vertue or Robert White, or those of that early member of the Royal Academy, Dance, those of that fine old landscape-painter, Linnell, or the treasures of delineated portraiture in the locked-up folios of the British Museum?

BIRMINGHAM.†

IN the year 1876 the Corporation of Birmingham resolved to publish a history of itself, and invited Mr. John Thackray Bunce, F.S.S., to undertake to edit the history. Upon further consideration, it was thought desirable to include an account of the earlier local government of the town.

Birmingham is probably regarded by most people as a modern town, but it existed in Saxon times. In 1309, the lord of the manor defended a right by contending that his predecessors levied customary tolls before the date of the Norman invasion. The ancient records of the courts leet and courts baron, and parochial records, are lost, but it is found that in 1392 was established the Guild of the Holy Cross, which was an attempt to develop, by the union of all classes, a kind of local government, and in some respects the character of the guild was peculiar to Birmingham; it was not a craft guild, nor a guild of merchants; it was not a town guild, in the strict sense of that name; it was to some extent a religious association, and also a social and friendly guild. The bailiffs and commonalty of "Bermyngeham" prayed the king (Richard II.) that they might make and found in honour of the Holy Cross a guild and lasting brotherhood of brethren and sisteren among themselves in the town, to which should belong as well the men and women of Bermyngeham, as men and women of other towns and of the neighbourhood who were well disposed towards them; and that the king would grant licence to John Colleshulle, John Goldsmythe, and William atte Stowe, that they might give and assign certain houses, land, and rents to the master and wardens of the guild for works of charity, according to the orders and will of the bailiffs and commonalty. A jury was appointed to examine whether the giving of this property by John, John, and William, would leave them sufficient to meet their engagements to the crown, and other burdens which it belonged to them to bear; and whether they would still be liable to be put upon assizes, juries, &c., so that through the proposed gift, and in default of the givers, their neighbours might not be charged with more than their due burdens. The jury answered in favour of the petition, and the guild was established; and 50*l.* paid to the king, said to be equal to at least 1,000*l.* in the present value of money.

The first local governing Act was obtained in 1769, at which time the population was 30,000, and the number of houses 6,025. At that time the streets were narrow and irregular; the pavements wretchedly imperfect; there was no drainage; the removal of refuse was unprovided for by any public organisation; there were no scavengers; at night all was pitch dark, save for the light of the moon or the rays of a friendly lantern. New-street was entered through a narrow gateway, and was used as a pig-market. The Bull Ring, the only open space, was blocked by shambles and slaughter-houses, and other offensive buildings. The parish church was literally hidden by obstructions of the same character.

This first Act appointed commissioners for "laying open and widening certain ways and passages within the town of Birmingham, and for cleansing and lighting the streets, ways, lanes, and passages there, and for removing and preventing nuisances and obstructions therein," and gave powers to buy and sell property scheduled in the Act, to appoint and dismiss "such and so many scavengers, rakers, or cleaners of the streets, and lighters of lamps, and so many clerks, treasurers, and other officers as they shall think proper." Every Friday, between the hours of six in the morning and two in the afternoon, the inhabitants were to sweep the streets and ways in front of their premises, and collect and put together the dirt in the streets, ways, lanes, and passages, to the end that it be ready for the scavenger to carry away. This obligation extended to a space of 12 ft. from the front of all occupied premises. The scavengers were to give notice by ringing a bell, so that the inhabitants might bring out ashes and other refuse from the houses for removal. All this might be done by the commissioners for those inhabitants who chose to make a payment for it.

In describing what officers should be appointed, it appears not to have occurred to the framers of the Bill that a surveyor would be necessary, or a superintendent of the sanitary affairs of the town; this, we may suppose, would be intended to be well performed by committees. The market for cattle within the town was to be removed from High-street to the street called Dale-end, and not elsewhere. Subsequently to 1769 the Street Commissioners obtained a second Act; a third, a fourth, and, finally, a fifth Act, in 1828.

This last gave the Commissioners authority over lighting, watching, paving, cleansing, and draining the town. All new streets were to be 14 yards wide; gutters were to be made and paved by the Commissioners, the cost being charged to the "ground tenants or owners" of the properties; owners of houses in new streets were to cause the square of their houses, into the middle of the street, both carriageway and footway, to be paved; and thereupon all such owners were to be exempted for the space of ten years from paying any of the rates or assessments called the highway levies.

By the Reform Act of 1832 Birmingham was erected into a Parliamentary borough; but while the political rights of the town were admitted and established, the local government was left untouched. It remained as it was constituted more than sixty years before. The paving, sewering, and other sanitary work was still vested in the Streets Commissioners.

The Municipal Corporations Act of 1835 did not directly incorporate any towns, but gave power to the Crown to grant charters to them on petition of the inhabitants, and it was not until 1838 that Birmingham was incorporated. The charter was received in Birmingham on November 1st, 1838, and was taken to the office of the *Journal* newspaper, and was there opened by Mr. William Scholefield, the high bailiff, who immediately published it in full in the newspapers. Mr. R. K. Douglas, the editor of the *Journal*, afterwards in a speech, at the official reading of the charter in the Town-hall, said that when it was received at the *Journal* office all the members of the committee were looking out for the arrival of the precious document. Mr. Hutton went twice to the railway-station in search for it. The validity of the charter was disputed, owing to the vagueness of some of the clauses, and the control of the police was taken away from the Corporation, but in 1842 it was restored, and the charter confirmed.

But the Act gave the Corporation only limited powers. The old Streets Commissioners, under the Act of 1769, remained, and there was great division of opinion in the borough until 1848, when the establishment of the General Board of Health seems to have had the effect of uniting all parties,—uniting them to oppose it.

This measure gave the General Board large powers of interference with local government, particularly with regard to sanitary reforms, and authorised the Board to prepare and submit to Parliament provisional orders erecting new local authorities, consolidating conflicting jurisdictions, and extending the area of united bodies. The Corporation petitioned against the Bill, and

* "In nothing," has remarked M. Geo. Duplessis, the director of the Print Department of the Bibliothèque Nationale, "have the English artists succeeded so well as in the delineation of the human physiognomy."

† History of the Corporation of Birmingham. By John Thackray Bunce, F.S.S. Vol. I. Published for the Corporation, by Cornish, Brothers, Birmingham. 1878.

it was amended, and the Council of the Borough was constituted the Local Board of Health.

The Bill having passed, steps were taken to give effect to it, and a memorial was presented to the General Board asking for an inquiry into the sanitary condition of the borough. "Mr. Robert Rawlinson, C.E., was appointed to hold the inquiry. For this purpose Mr. Rawlinson visited Birmingham on the 12th of February, 1849, when the inquiry occupied four days, and again on the 1st of May, 1849, when he again sat for several days, besides making a thorough personal examination of the town. All the local governing bodies were represented at the inquiry, and witnesses on their behalf, as well as independent witnesses, were examined. Indeed, there was a general willingness to offer evidence, so that the inspector had abundant materials for his report to the Central Board. Mr. Rawlinson's Report, dated May, 1849, constitutes a volume of 100 pages."

Then came the united opposition.

"Mr. Rawlinson's report was vigorously and even bitterly criticised, many of its conclusions were disputed, and its recommendations were contested with a vehemence which seems very strange when looked back upon from this distance of time. The controversy was general—in the privileged governing bodies, in the town council, from landowners and companies who thought themselves aggrieved, and from private persons who had interests to preserve or theories to advocate."

After a long period of dispute between the Town Council and the Streets Commissioners, the latter body introduced a Bill into Parliament, in which they proposed to make provision for the following objects:—1. To constitute the Town Council the sole governing body for municipal purposes, and to transfer their own powers and property to it; 2. To constitute, for drainage and other purposes, a district extending beyond the limits of the borough, and including parts of Aston, King's Norton, and Handsworth, defined by them as "the natural drainage area"; 3. To alter and renew the system of rating.

This, it appears to us, would have been a very wise measure (and, in fact, the extension of the drainage area has since been crrried out), but it did not pass the Standing Orders Committee of the House of Commons, and was therefore thrown out. The Town Council now (August, 1850) resolved to prepare a Bill to deal with the whole subject, and at a conference with the Commissioners, the two bodies agreed upon a draft scheme; but the idea of central interference still haunted the Commissioners, and they opposed the Bill before Parliament; but by degrees the opposition of the Commissioners and other bodies was conciliated, defeated, or withdrawn, and the Improvement Act was passed on the 24th of July, 1851. The formal transfer of the Commissioners' powers and property took place in December of that year, and the Council proceeded to arrange its committees for the transaction of the extended business entrusted to it.

These Birmingham people are evidently strongly against receiving instruction from a "central authority." As to control, beyond offering instruction in those things which the Government had fuller means of arriving at the truth of, and which concerned all the people alike in every town,—*i.e.*, in sanitary affairs,—we suppose there never was an intention to institute "control" by any Government. And it has not been only Birmingham which has offered this opposition, but Manchester and, in their wake, towns generally. Whether they have been wise in their resistance we shall see. We have an idea that the bottom of it all has been political rancour and animosity, and that local governing bodies have cared more for the political supremacy of Whig, Tory, or Liberal, than for the health of the people. But if their principle be right there can be no denying great merit to the people of Birmingham in this matter.

Society of Engineers.—At a meeting of the Society of Engineers, held on Monday evening last, a paper was read by Mr. Joseph Bernays, vice-president, on "The New Pits and Hauling Machinery for the San Domingos Mines in Portugal." The following gentlemen were balloted for as members, and duly elected, viz.,—Mr. Charles Aspull Wells, Mr. John Haswell, Mr. Charles Harper, and Mr. James John Musto.

THE GLASS WORKS OF MURANO.

THE Cross of the Legion of Honour has been awarded to M. Giovanni Castellani, the director of the Royal Society of Murano, for his efforts in aid of the Murano Glass Works.

These are the most celebrated works, of their class, in Italy, though, for a considerable period, their ancient reputation had been obscured. Some enterprising Italians, however, of recent years, so remarked the avidity with which specimens of old Venetian glass were sought throughout Europe, not merely in the forms of mirrors, mosaics, and enamels, but also in those of coloured pearls, and false gems, that they conceived the idea of re-establishing at Murano the manufactures which once made it famous. The town had never, indeed, entirely lost its supremacy in this respect, and still contained a race of artisans to whom the secrets of their forefathers were not altogether unknown. Murano was, in the Middle Ages and during the Renaissance, the great centre whence Europe was supplied with this species of commodity, and with mirrors and ornamental glass, for decorative purposes, more especially. The island on which it stands was favourably situated for commerce with Egypt and the East; it possessed, and still possesses, admirable materials for the fabrication of crucibles and furnaces; brick clay, sand in abundance from the Adriatic shores, and alkalis inexhaustible. So far back as 1383 a decree of the Senate invested it with privileges for the pursuance of this art, "which," it set forth, "must for ever be a noble one, and shall find a permanent home here." The manufacture was divided into four classes:—window and rough glass, goblets and blown glass, blow-pipes for bugles, and so forth; and blow-pipes for more delicate and special fabrications. There was a regular administration established, the details of which need not be dwelt upon, seeing that they are mere antiquarianisms now; but one regulation was curious, enacting as it did that, between the first day of October and the last day of July,—the rest of the year being a kind of close season,—no manufacturer should vary either the number of his crucibles or the processes of his industry. The fame of these works extended itself rapidly through the countries of the West and of the East. Marco Polo, it was said, brought home from the Indies the art of making goblets encrusted, to all appearance with garnets, agates, and even steel beads, which were eagerly bought up by the Oriental merchants, as preferable to their own, while "Venice pearls" became a fashion in rosaries, particularly those worn by pilgrims to the Holy Sepulchre. The manufacture went on from these beginnings to flagons and glasses for tavern-keepers, and even to lighthouse lanterns,—the richer sorts being white, tinted, gilt, or enamelled, illustrating a marvellous variety of fancy and luxury of taste,—in chalices, cups, candelabra, drinking-flagons, mirrors, decorations for buildings, mock jewellery, and imitations of almost every flower that blooms on the earth. To reach this favoured spot, on which none of the dreaded Venetian secret police, or the *sbirri*, were ever permitted to land, the only means is a gondola, which carries the visitor up the canal that forms "the principal street" of the town, and on the banks of which,—the Glassmakers' Strand,—the whole of the factories are situated. On each side runs a narrow quay, whereon are landed the raw materials necessary for the works, and whence are embarked the fabrics in their completed state. The least artistic of these, perhaps, though that giving employment to the largest number, is that of those artificial pearls, in amber or agate, which so largely figure in popular Parisian embroidery, though they find a market in every quarter of the world. It was by them, indeed, that Columbus and Cortez originally established a trade between Europe and the Americas, and to this day, in some parts of the East, they, strung on threads, are used as money. The principal interest of the Murano works consists, however, in the process and apparatus of manufacture. The materials employed in making the glass paste are, then, speaking generally, the sand of Pola, the "soda" of Catana, and Egyptian alkali, variously coloured with antimony, arsenic, manganese, and minium, though, for tinting the finer qualities, other substances are employed, among them being silver and gold, the latter more commonly. As much as 5,000*l.* worth of it has been consumed by one establishment in a single year. The whole of the materials to be used are first pulverised, mixed, and thrown together to "try,"—in other words, to be calcined, in a furnace, whence it is taken and deposited in a close space to cool down to a particular point, the attainment of which is most sedulously watched for. These furnaces are made from what is called, by the Muriani, the "refracting earth" of Cerona, brought from the Friuli Hills, mingled with a kind of sand recently discovered among the neighbouring rocks of Schio, and will bear any degree of heat, but they only last for about two years of forty-four weeks each, the remaining eight weeks being always given up to settlements of accounts, and arrangements for the execution of future orders. During the latter time, not a solitary furnace-fire is allowed to be kindled on the Glass-makers' Island of Murano. But, while the working season lasts, they are kept incessantly going, rarely needing repair, until condemned and broken up, to be made into new ones. Their dimensions, of course, are various. Those dedicated to ordinary pearls may contain as many as five large crucibles holding 12 cwt., each, of material to be calcined, while those for the more delicate varieties, requiring more separate care, require only one, the gradations of temperature, moreover, being different for the different qualities. No coal is used, but only wood, and it is essential that this shall be perfectly dry, to which end special stores have lately been constructed.

The vitreous paste remains in the crucibles from twelve to seventeen hours, according to the specialities of its composition and colours. When once the glass becomes sufficiently malleable to be dealt with, it must undergo a preliminary operation, indispensable to the entire Murano manufacture, and distinguishing it from many others: it must be wrought into long rods, hollow or solid, called by the workmen "canes," and it is from these "canes" that the Muranese glass-maker elaborates the marvels of his art. This process, whether applied to glass or to enamel, demands an almost natural aptitude,—the natives protest that it is their secret,—but, at all events, an extreme dexterity of manipulation. The workmen employed upon it are distributed into relays, succeeding each other every six hours, for the labourers must never cease by day or by night, and the division of labour among them is interesting. There is a chief of the bank and a chief of the place. There are two sub-masters, who superintend the making of the paste into a cylindrical form, and these have four assistants. One sub-master takes a rod of iron, which may be of any thickness, about a yard and a half long, and heated at the end farthest from his hand. This he plunges into the cauldron, appropriates a certain quantity of the paste, and lays it, still almost liquid, on an iron table, fitted with a stool, and upon this it is deftly rounded. Sometimes he then dips and cools it in a vessel of water, and plunges it into another cauldron, to get a new incrustation, and so, alternately heating, cooling, and hammering, obtains the mixed material upon which another set of artists then proceed to work. The rod is often drawn out in the "galleries" to an immense length, after which, whether the size of a finger or attenuated to a thread, it is given over to the cutters and reducers, the latter preparing it for conversion into pearls, with various inlays of colour. There is, in the Murano Museum, an example of which the people are naturally proud, as demonstrating the wonderful delicacy of their manipulation, a glass rod, the section of which exhibits a portrait of the late King of Italy in flesh tint, but with hair, moustachios, eyes, and uniform variously coloured, and if, says an enthusiast, this rod could be sliced through its whole length, into thin cylinder-shaped pieces, the portrait of the king might be almost indefinitely multiplied. Flowers, animals, innumerable types of decoration, marvellous combinations of colour,—pink, black, brown, silver, purple, blue, and so on, spring from a pure surface of opaque white paste. The sections, however, are far from being invariably round; they are often square or triangular, to furnish ornaments and drops for lamps and chandeliers. Of course, in the imitation of ruby, coral, opal, and so forth, different bleadings are necessary; but in all the glass into the composition of which gold enters,—as in the red and rose tints; or in silver, as in amber,—a second exposure to heat is essential. So with enamels, with the celebrated "Venetian" glass, and that renowned aventurine, discovered

by Miotti about 150 years ago. This is the substance which the old masters, according to tradition, employed when they introduced vases, chalices, or goblets, into their pictures. The elaborate character of the work is suggested by the fact that every pearl sold to children in the streets of Venice has passed through seven different workshops in succession; but machinery bids fair to simplify the processes,—possibly to deteriorate the results. But it is for the nobler branches of the manufacture,—the art, as the old senate styled it,—that the little neighbour of Venice is chiefly concerned, and upon the production of its masterpieces, labour and patience little short of miraculous are often bestowed. Examples are known of success after a hundred failures; while, again, the workman who sees that he cannot fulfil his actual idea, but must change it for another, cannot stop to think,—cannot stay his hand; he has instantaneously to alter the design of a swan into a dolphin, or of a rose into a dahlia, or his task is irretrievably spoiled. We have left ourselves no space to enter the other workshops wherein the celebrated Venetian mirrors, with frames of the same material, are cut and polished; but the modern revival has not been so triumphant in this as in other respects, and, besides, specimens of them are to be found in nearly every museum of Europe.

MONUMENTAL SCULPTURE.

THERE is one branch of sculpture in which it must be admitted that nearly every one, be he a lover of art or not, is interested, and that is monumental sculpture. Each one of us, in passing through the term of his life, if he attains to manhood, must be, more or less, at one time or another, concerned with some monument or memorial of those who have passed away before him. Thus, however little the world at large may interest itself with the ideal productions of the sculptor, it must, from the very nature of life, be sensibly concerned with monumental sculpture. Hence there is a wide field open in this department for modern sculptors.

But let us see what is the actual state of matters in this respect, and whether there is a demand by the public for fine monumental works of art, or, on the other hand, any effort by the sculptors to raise the national taste by supplying pure memorial works of art. Regrettable though it may be, it must be acknowledged to be a piece of common knowledge that the people at large are quite careless about the character of their sepulchral monuments, and that there is no vigorous attempt made by artists to produce monumental works which are grand and solemn, or simple and elevated, in their nature. Let any one pass through any of our large public cemeteries, such as Kensal Green or Brompton, and his eye in a very short space of time will be utterly disgusted with the complete absence of anything like genuine works of art. Those monuments which are not absolutely bald and characterless are pretentious and vulgar, devoid of any traces of a cultivated imagination or a knowledge of the principles of sculpture in the artist. Those to whose lot it falls to erect these melancholy memorials, if possessing taste or delicacy of feeling, will do no more than seek for the simplest and most inoffensive design, such as a Latin cross. If they endeavour to obtain some work of a more suggestive or more ambitious character, there is at the present day an utter absence of anything like pure work to be obtained. And the same may be said of monuments of the most important description,—an utter absence of freshness, a complete conventionality, are visible. As a matter of fact, there has, in regard to these, been a great diminution in number; bas-reliefs in the interior of churches do not meet with much approbation from the modern ecclesiastic; he is all for windows of glowing colour, and not by any means in favour of marble monuments. For many reasons this tendency is to be regretted: sculpture is eminently suited, in its purity and grace, its calmness and solidity, to be employed in monumental works; nor should it ever be forgotten that Flaxman, the greatest sculptor whom this country has produced, owes some of his justest fame to his monuments. We need only mention that magnificent work of art, the Baring monument in Micheldever Church, in which the scenes illustrative of the Lord's Prayer are to be found, without going into further details to show how the first of modern English sculptors gave himself up from time to time to this species of artistic creation. Nor is it necessary to recall the practice of the ancients. Think only, by way of one example, of the great monument of Queen Artemisia of Caria to her royal husband, the Mausoleum of Halicarnassus, and we must acknowledge that the most skilful of ancient artists devoted their imagination and their powers to monumental sculpture. Therefore it must be obvious that the coldness with which ecclesiastics regard internal monuments in churches acts to the detriment of modern sculpture. For the monumental bas-relief affords opportunities of the amplest kind for the exercise of the imagination and for technical skill. It brings the art of sculpture home to the most uncultivated of mortals; it may symbolise with purity and taste, or depict with restrained vigour, the virtue and the character of the humblest mother or the most celebrated statesman. And we feel quite convinced that this present tendency to which we have just adverted is seriously damaging English art; for, looked at from the lowest point of view, it cuts away a large and a lucrative field from the sculptor's reach,—a field where he could be at once usefully and honourably employed.

But there yet remains the open churchyard or cemetery, which we began this article by noticing, where, as we have already said, the absence of popular taste and of any high efforts on the part of artists is now so strikingly apparent. Yet the principles of ornamental sculpture are plain and few, whether a monument be symbolical or personal. Purity and solemnity of style, taste in the conception of the subject, are the cardinal rules of this kind of work. Every sculptor cannot be a Flaxman, but every sculptor can seek to make him his model, for in his monumental works we have, perhaps, the finest examples of this class of sculpture which this country is ever likely to produce. But the man who does not possess the power of his imagination, can yet cultivate his purity of taste, and thus avoid the flaring vulgarities of treatment which are most obnoxious in monumental work. That the public generally do not demand a higher class of work than is turned out from the workshops of the Euston-road, is, to our mind, a somewhat melancholy commentary upon the value of the art-teaching and literature of which so much now-a-days is heard. A mind which is genuinely educated in the principles of art, whether they be seen in Grecian marbles or Italian pictures, should be able to apply these rules to the most important and the most trivial matters of everyday life which are concerned with art. The principles of proportion and of harmony of grace and form which are required by a well-dressed woman in her costume are equally applicable when she comes to choose a tombstone for her husband.

It seems clear, therefore, that those who would improve the art of this country, of which monumental sculpture within or without places of worship form a most important part, should endeavour to raise the character of this kind of work. Foremost among these are the clergy of the Church of England. When nothing more pretentious is required than the simple piece of wood which moulders under the elm-trees of Hertfordshire graveyards, beneath which lie the village elders, he can do nothing; but when a more pretentious monument is needed, it is eminently the duty of cultivated clergymen to raise popular taste in this respect. And next, the sculptors of the day, rising or risen, should not neglect this field. The young sculptor, like the German Schwanthaler, may well give to it some of his hardest work and clearest thought, and the man of fame, thinking of Flaxman, of Canova, and of the ancients, may well devote to it some of his mature powers. Then there would be some prospect of seeing the present glaring dreariness or intense vulgarity of our monumental sculpture disappear, and in its place we should find work more calculated to please those who survive, to elevate the taste of those who take note of these things, and to do honour both to those whom these works commemorate and the sculptors by whose brain they were devised, and by whose hands they were executed.

A Fine Art Exhibition for Dundee.—A meeting of the general committee of the proposed fine-art exhibition, Dundee, was held on the 24th ult., when it was resolved that a fine-art exhibition should be opened in June, and that an industrial department should be added.

ROBA DI CARNAVALE.

CARNIVAL has come again, and with it all its traditions, here in Venetia of such exceptional celebrity, in spite of the renown of Milan, Rome, Turin, and so many other Italian cities. For weeks past the innumerable grocers who seem some of the few successful tradesmen of the larger towns, have piled up in their windows countless lumps of by no means too-inviting butter, *di Milano*, of course, surrounded by picturesque festoons of the small sausage or *luganega* of this province, and all the other luxuries of the Italian kitchen, not forgetting the appetising *prosciutto* and the Parmesan cheese,—a daily necessity in Italian families of nearly every class. For days past good housewives have been preparing all sorts of nice things of a sweet nature, generically termed *Roba di Carnavale*, while appetising apple-fritters, indigestible dough nuts, and what not, frizzle and sputter at the door of nearly every fruit-shop.

Carnival is the foreign Christmas, and Carnival, like that time-honoured feast with us, comes but once a year, and with it what fortunately, or unfortunately, we do not have, a forty days' fast succeeding it, during which no meat or butter may be taken by devout Catholics. Traditions, so far, are still as alive as ever, but the riotous enjoyment and frank abandonment of all common sense, which seem so inseparable from Carnival, are rapidly dying out, alone fostered by a few traditionalists, the children, and the interested tradesmen. Carnival committees, notwithstanding, have been formed and funds collected, with difficulty, as may be imagined, and programmes issued in all the large cities.

In Venice, as also in Treviso, for of these two cities in Venetia we can alone speak, a platform is raised in the *piazza*, where dancing is kept up in costume to the strains of appropriate music, tombola and raffles are held, and various other amusements go on.

In Venice, where the antique traditions, like rank, demand certain obligations, efforts have been made this year to procure the strangers and citizens some genuine amusement. In addition to the usual fund of enjoyment afforded by the ever-joyous "Chiozzotti" and the "Napolitani" of Venetian fame, the Carnival has offered this season an especial and novel attraction in a Gastronomic Exhibition held in the well-known *Libreria antica* of the Palazzo Reale, Scamozzi's Procuratie Nuove of the old republic.

"Gastronomes of Italy," ran the enticing programme issued some while since, "'we eat to live, we do not live to eat,'" Molière has said in his famous comedy of the 'Avare.' The maxim is true, but no less true is it that to live well, we must eat well. We see, indeed, in the remotest times, Achestrates of Syracuse, the contemporary of Pericles, undertaking a long and perilous journey through the world to study in every country the art of cookery, and on his return singing the praises of gastronomy in a poem which Ennius did not disdain to translate. And under the Romans, Apicius and Lucullus both rendered glorious the gastronomic art; in our days Cambacères, Brillat Savarin, and the Marquis de Cussy. Wishing, therefore, to raise the culinary art to the level of these progressive days, and give life and soul to such an important production of human good taste, the Carnival committee has decided to open a great Gastronomic Exhibition, in which are invited to compete all the cooks, pastry-cooks, and confectioners of the city and the provinces," &c.

As for the programme, with its promise of fifteen medals, in gold, bronze, and silver, the rules and the division of the exhibition into the different groups, it cannot be too warmly praised, while the raffle of the exhibits to complete the show added with the general public a further interest. Such an exhibition in London, we feel sure, could not fail to meet with universal success, though in reality the confectioners' shops of any large city afford a daily gastronomic exhibition at the disposal of those who take an interest in such matters.

On Tuesday, the 18th ult., opened this long-expected treat, and many hundreds were the visitors who crowded through the beautiful *Porta delle Cariatide* in the Piazzetta, and ascended the graceful staircase, the ceiling of which has roused the admiration of so many generations, and which our own South Kensington authorities have made such an effort to reproduce; but few, we suspect, except the

appreciative stranger, stopped to admire the apparently facile work of the past which we find it now so difficult to revive; or the beauty of the antechamber, whose chief decoration, by the way, consists in the two dozen superb sixteenth-century chairs which are ranged round the walls, in undisturbed order, their covers, sad to say, worn out, and replaced by dark-coloured American leather.

On a large central table, in the once magnificently decorated *Libreria antica*, of which only the ceiling seems to have been spared from the old days, were displayed the dainties, surrounded by an admiring crowd of gastronomic critics.

Needless to describe these dainties in all their tempting beauty, though this we may say, that many a London or Parisian supper-table is supplied with as attractive objects, made, it is true, by the Venetian artists who have left, as so much talent seems to have left, their native city.

Who does not remember in Voltaire's romance the dinner at Venice of the thirteen dispossessed kings, and here really one might imagine that banquet revived in the superb dish of noble lobsters, pheasant pie, the stuffed boar's head in galantine, or the nauseating sweets. Dante, in his "Purgatory" and "Inferno," has given us all an excellent idea of the possible torments of a future existence; the Holy Inquisition, from all accounts, possessed a genius in the invention of fresh tortures; but neither Dante nor Torquemada, nor Pietro Arbues, of famous memory, notwithstanding the classic authority of Tantalus, seems to have dreamt of a gastronomic exhibition for a hungry heretic, forbidden to touch anything by placards at every turn.

The Gastronomic Exhibition was a complete success, and will, doubtless, long mark the Carnival of 1879. As for the festivities of the official opening of the season, the fun of *Giovedi Grasso*, and still more of the last days, and *Martedi Grasso* (completely annihilated by the hurricane which the New York bureau so correctly announced), these have been too often described, and really this year in Venetia have passed off in the midst of such solemnity and indifference, that they need little more than reference.

The glories of Carnival seem to have disappeared with the death of the *Descente de la Courtille* at Paris; alone kept up in their old vigour, if not ruffianism, in some of the western cities of the United States. The advertisement sheet of a Parisian paper at this season scarcely contains a single announcement connected with Carnival, though not a few may be found in the Italian journals. There are still traditionalists who, after the enjoyment of Carnival in Venice, refuse to don the hair-shirt of Ash-Wednesday, and hurry off instead to Milan, where a special privilege allows Carnival another week's existence. But these are dying out. We have now Carnival every day, and the enjoyment which in the past came but once a year, we have every moment at our command, and Mrs. Gilpin's famous holiday comes to every one now once in as many days as then it occurred in as many years. But, above all, the beauty of the Carnival of the past is gone, replaced by vulgarity and degenerated traditionary emblems and decorations, as in our own Lord Mayor's Show. Gone are the days when such a Carnival treat could be enjoyed as that held in the early part of the thirteenth century in Treviso, and famous in the history of ceremonies.

Terrible as were the wars and vengeance of the Middle Ages, splendid were their fêtes and amusements. In 1214, in the chief Piazza of Treviso, was erected a wooden castle, covered with rich silken hangings and tapestry. Two hundred beautiful damsels, chosen from among the most attractive of the city and the country round, held this tower, the Castello d'Amare, all armed with elegant cuirasses, their head-dresses resplendent with gems and gold. The youths, equally gorgeously costumed, were the besiegers. Oranges, sweets, and fruit whirled in the midst of clouds of flowers and scented waters, formed the offensive and defensive arms, though the most deadly weapons were shot from the conquering eyes of the two hundred horseless amazons. Nearly six thousand strangers came at the invitation of the city, not alone from the neighbourhood, but even from Lombardy, and were fêted for a week with all their retainers, at the cost of the city, then in its most glorious period of prosperity. And in the midst of this concourse the siege proceeded merrily, to the immense satisfaction of all; but the warm-blooded Venetian youths, having first planted the rose-coloured standard of St. Mark on the castle walls, the Paduans could not contain their wrath; indeed, the struggle would have been a serious one, had not the authorities intervened. Eventually the castle capitulated, and with it its charming garrison, amidst the cheers of the delighted spectators.

Another Carnival, during the last years of the sixteenth century, was marked by a superb joust carried out with all the formalities of the Middle Ages, and after the joust, came a bull-baiting, gay masquerades, music, and dancing, succeeded by the dull, monotonous psalmodies of the votive procession of Holy Week, lighted by the flickering torches of the devotees who had religiously kept their forty days' Lenten fast.

But now, much in the same spirit, both Carnival and Lent are but little regarded, and in Venice, as also here in Treviso, so few masks have been seen about this season that even among the people themselves surprise has been expressed. As for the costumes, gone are the days of the gorgeous dresses of the Castle of Love, and the rich silks and satins and hanging tapestries of later days, the silken banners, and the flowers. Mr. Nathan, the well-known costumier, who has so long been, notwithstanding his reputation, the horror of all artists,—Mr. Nathan, we repeat, is a perfect Planché in the correctness of his taste and knowledge to the costumiers of Venetia.

The success of Carnival depends on the temper and feelings of the people, and here in Italy, especially in Venetia, these feelings are not too buoyant or over-elated at the general prosperity. Hawthorne, in that most charming of all Italian romances, "Transformation," is right when he says,—"Unquestionably a care-stricken mortal has no business abroad when the rest of mankind are at high carnival; they must either pelt him and absolutely martyr him with jests, and finally bury him beneath the aggregate heap, or else the potency of his darker mood,—because the tissue of human life takes a sad dye more readily than a gay one,—will quell their holiday humours like the aspect of a death's-head at a banquet."

Here, in Venetia, the death's-heads of all the departed Carnivals seem to have been lurking at every corner, to judge by the solemnity with which the season has passed off.

As a piece of disinterested advice to all in England who may wish to enjoy, without much trouble and at no great expense, the pleasures of Carnival with some of its old fun and *Mardi gras* festivities, we would counsel them to pass Carnival week in Brussels,—a gay yet thoughtful city at all times worthy a visit, and where the ceremonies of Easter Sunday in the quaint old church of St. Gudule are, in the opinion even of those who know both, but little surpassed by the ceremonies of St. Peter's when Rome was still the Pope's capital.

Venetia.

THE EXHIBITION OF WEDGWOOD WARE AT THE LIVERPOOL ART CLUB.

THE Liverpool Art Club is deserving of very much praise for the way in which it fulfils its functions; for we take it that no art club can be said, at least in a provincial town, to be worthy of the name which does not in some way, small or great, endeavour to enlarge the intelligent appreciation of art. We say, at least in provincial towns, because in the metropolis there are other bodies and exhibiting institutions which are continually at work, so that an art-club in the metropolis is naturally and properly chiefly social in its character. But to return to our immediate subject. By the present collection of objects, nearly 1,500 in number, in Wedgwood ware, the people of Liverpool will be enabled to obtain a distinct mental grasp of Wedgwood ware as a whole; for there is no way so certain to convey a distinct impression of an artist's or a workman's power, as by bringing together a large number of examples of his work. This same club indeed, was very successful in this respect in the collection of David Cox's work some two years ago, one of the most interesting and satisfactory exhibitions which we have ever seen. Nor, to take another art, can any one visit the collection of Flaxman's casts and drawings in the University College, London, without coming away with a really distinct impression of some of that great artist's special qualities.

And it is very fitting that Liverpool should be the place where such an exhibition should be held, for it already possesses a fine collection of Wedgwood ware in the Brown Museum, now the property of the Corporation, and presented to it by that enthusiastic and able student of Wedgwood, Mr. Joseph Mayer. Moreover, Wedgwood was essentially a north-countryman, not only from the locality where he was born and worked, but also from the shrewdness and ability which he possessed in addition to his fine and delicate taste. So that the producers of the interesting and carefully compiled catalogue are well justified in saying that "this exhibition is a tribute to Wedgwood's memory; not only because the Liverpool Art Club would wish to represent all our national art productions, but because Wedgwood was a neighbour to this town, and because the contents of this exhibition were produced within sixty miles of this building from the soil of an adjacent county."

The catalogue, indeed, reflects very great credit upon its compiler, Mr. Gatty, for it is something more than a mere list of the objects at the exhibition: it contains a number of biographical and critical remarks which will be a useful *aide-mémoire* even to those who have become familiar with Wedgwood and Bentley in Miss Meteyard's elaborate life of the great potter. And in it further is to be found an excellent little essay, with designs, on the "Marks on Wedgwood Ware" from the pen of Mr. Frederick Rathbone, of Brighton.

Coming more particularly to the collection which is arranged in the exhibition-room of the Art Club's premises, the most remarkable and striking characteristic which is at once apparent is the extraordinary variety of the ware which was turned out from the potteries of Etruria. Objects, both useful and ornamental and also purely ornamental, are here in abundance; and Wedgwood ware must be held to be the most remarkable from the fact that it was as much made for purely ornamental purposes, to depict graceful form with delicate colouring, as to serve the ordinary and commonplace purposes of every-day life, whether to hold dishes of tea or toast and butter. And there can be no doubt that Wedgwood had in view quite as much purely artistic as purely utilitarian purposes in the manner of his work; for in his own catalogue he thus expounds his views upon this point,—"Those who duly consider the influence of the fine arts on the human mind will not think it a small benefit to the world to diffuse their productions as wide and to preserve them as long as possible. The multiplying of copies of fine works in beautiful and durable materials must obviously have the same effect in respect to the arts as the invention of printing has upon literature and the sciences; by their means the principal productions of both kinds will be for ever preserved, and will eternally prevent the return of ignorant and barbarous ages." So that we find united in Wedgwood qualities which could not fail to produce a remarkable result, untiring energy, and great shrewdness and capacity for business, a quick and fine natural taste, and high artistic aims working in a practical form. As an example of the variety of Wedgwood's productions, we have no more to do than to give the several divisions of the catalogue itself. There are, first of all, cameos and intaglios; secondly, bas-reliefs, medallions, and tablets; thirdly, the portrait and character heads, figures in the round, and on small or large medallions; and fourthly, the purely useful articles, such as inkstands, dessert-dishes, and things of a kindred kind. But certainly, to our mind, the most attractive articles which Wedgwood manufactured were the bas-reliefs, such, for example, as the beautiful work the Apotheosis of Virgil (No. 645), an oblong bas-relief modelled by Flaxman,—"the genius of sculpture," as Wedgwood, long before the sculptor became famous with kindly and prescient mind, liked to call him, with white figures standing out of the delicate pale blue jasper ware; or, again, we might mention another noticeable object (No. 653), "Hercules in the Garden of the Hesperides," also an oblong bas-relief from a beautiful Etruscan vase, in the collection of Sir William Hamilton, which is now in the British Museum. This, too, was modelled by Flaxman, in August, 1787, and has a white jasper ware body, with the ground and back washed green, and is in size 13 in. by 5 in.

Not the least interesting objects in this collection, and quite unique, and irreplaceable of their kind, are the portrait heads, especially of illustrious moderns. Of these, Wedgwood him-

self thus wrote:—"These heads are made either in black basalts, or blue and white jasper. They are of various sizes, and different prices, from one shilling a head to a guinea [we wonder how much a shilling medallion would now fetch], with and without frames of the same composition, but most of those without frames in one colour are sold at one shilling each." In form they are generally oval, and of jasper ware. Among them are to be found portraits of all kinds,—Sir Joseph Banks, the naturalist, Captain Cook, William Pitt, Sir Joshua Reynolds, and so on, *ad infinitum*.

The examples which we have given will illustrate to some extent the richness of the present collection. We might, indeed, give numberless other instances. We might cite the celebrated copy of the Portland vase, bracelets, allegorical figures, and the famous set of chessmen (No. 1,396) in blue and white jasper, designed, like so many of Wedgwood's best productions, by Flaxman. But of such enumeration there is no end. All the objects exhibit the same beautiful material, and all show designs and forms more or less graceful and full of taste. No doubt Mr. Gatty's criticism in this respect is well founded when he says that "it is a matter of regret that so much power was expended over what is, after all, only the reproduction of another man's design, and it seems a pity that Wedgwood, who wrought such exquisite fabrics from the soil of his native country, should not have gathered also from England and English thought the art conceptions which were to give form to his materials." But it must be borne in mind that, so far as designs upon his china went, Wedgwood had to use the best agents he could find, and that in the part of the designs of the actual articles with which he himself had to do,—namely, their elementary form,—he effectually carried out the principle that the first object of articles of utility was that they should be the best and most fitted for actual use. "There are," to quote again from the compiler, "no plates and dishes, teapots, and cups and saucers, so admirably adapted to their purpose, and provided with such efficient rims, spouts, and handles, as his." Here he was eminently successful, as we hold, too, that he was in respect of his surface designs; for, though the latter may have seldom been original, they were always copies of or suggested by fine models, and these are very preferable to insipid or vulgar designs of an original kind.

The exhibition which the Liverpool Art Club has now thrown open to the public possesses, it thus will be seen, far from a merely local interest in a place of vast commercial importance. The members of this society have given to the public view the productions of a man who showed unspotted integrity and the keenest faculties of business, united with a cultured taste and high and artistic aims. No man could be a more fitting example and contrast to many of the commercial men of to-day.

ENGINEERING PROGRESS IN FOREIGN COUNTRIES.

We announced some little time since that the Institution of Civil Engineers were about to add to their usual annual publications an abstract of the progress of engineering in foreign countries. The first of these abstracts has just been issued, and its interest is such as fully to answer the expectation we expressed as to the utility of such a publication. It is, of course, out of the question to give an abstract of this little pamphlet; because, though containing only forty-one pages, it is itself only an abstract of the series of abstracts published in the proceedings of the Institution, to which it is thus of value chiefly as an index. At the same time, it is an index which points out the great value of the more detailed publications of the Institution.

The abstract is divided into four parts. The first comprises public works; the second, machinery; the third, mining and metallurgy; and the fourth the application of electric science to engineering. So rapid is the progress of science, and so vast the field now covered by the labours of the engineer, that each one of these several departments furnishes enough of novelty and importance to make a great demand on the time of the general student, while furnishing in itself a special department of the profession.

As bearing upon building, the most important progress indicated by the great public works of the year has been in the construction of bridges, including the spanning great widths by steel girders, the fixing of the same without the use of centreing, and the sinking of foundations to depths hitherto without example. Thus the St. Louis Bridge over the Mississippi has two spans of 502 ft. each, and one of 520 ft. formed of two arched steel tubes braced together. The Kentucky River Bridge has a centre truss of 375 ft. span, which was erected at a height of 275 ft. above the water without scaffolding. The Moerdjik Bridge over the Hollandsche Diep crosses an estuary 2,840 yards wide. The foundations of a bridge in North Jutland are sunk to the extraordinary depth of 118 ft. below low water.

Great advance has been made in the appliances for preparing foundations, a subject of as much interest to the architect as to the engineer. On the River Dwina, a steam pile-engine, in which one machine works several rams, has been driving fifty piles per day; and effecting twenty-eight times as much work as an ordinary pile-engine worked by four men, at a sixth of the cost per pile. Another remarkable engine of this kind is worked by the explosion of gunpowder, a cartridge at the head of the pile being exploded by the fall of the ram, the explosion driving the pile down, and the ram up again to its original position. Pile-driving in sand by the injection of water has proved efficient at Calais. We do not see any reference to the new invention of hollow piles, with solid points, which form their own pile-engines, the ram falling within the pile.

Hydraulic works have been carried on to a large extent, and two masonry dams across valleys deserve note. One of them, across the Gileppe Valley, is 154 ft. high, 210 ft. broad at the base, and 49 ft. broad and 771 ft. long at the top. The other, across the valley of Enfer, is 170 ft. high, 110 ft. wide at the base, and 9·8 ft. wide at the top. The Gileppe reservoir will contain 16,000,000 cubic yards of water.

The activity displayed in the treatment of what are called secondary railways, comprising both steep mountain ascents and cheap light lines, has been far greater in America and on the Continent than in Great Britain. Of small-gauge railways it seems that Great Britain has only 26 miles, or actually 12 miles fewer than Java. In the United States 2,040 miles of small-gauge lines are open, and 7,552 miles are in course of construction. Throughout the world, in 1874, 5,040 miles were open, and 10,812 miles under construction. On these lines the rails, made of steel, are in some cases as light as 41 lb. per yard. Curves of 3 chains radius, and inclines of 1 in 28, have been introduced, and the cost has been kept down, in some instances, to below 2,000*l*. per mile. In the Grand Duchy of Oldenburg a line of 4¼ miles long has been constructed for 10,450*l*., including rolling-stock. The gauge is ·75 mètres; the rails, of Bessemer steel, weigh 25 lb. per yard. Four trains run daily each way, at a speed of about 13¼ miles per hour. The fuel used is peat, and the daily expenses amount to only 29*s*. The construction of fireless, or hot-water locomotives, and of compressed air engines, for city tramways, has also engaged much attention; and a steel steam coach for the common road, weighing 4 tons, and carrying 12 passengers, which has been designed by M. Bollée, accomplished a journey of 150 miles in 18 hours. It is said to make 5½ miles per hour up an incline of 1 in 20. It may be observed that when inclines of this nature are to be surmounted, it becomes questionable whether the diminution of friction caused by the introduction of rails is worth the cost. To ascend an incline of 1 in 20 demands a tractive force of 112 lb. to the ton for gravity alone. If we regard the diminution of running friction as being from 45 lb. to 12 lb. per ton, we only obtain a gain of 33 lb. per ton, or little more than a quarter of the power required. Mr. Stephenson's rule was that the gradient should, as far as possible, be such as to make the resistance from gravity equal that from friction, which he considered was attained by a grade of 1 in 330. When we consider, on the one hand, the economy of weight to be attained by the use of steel, and, on the other hand, the economy of power to be effected by reducing the velocity of the driving-wheels below that of the piston (which may be admirably effected by hydraulic connexion), it seems probable that steam coaches will yet hold their own against light railways in many country districts.

In the departments of machinery, mining and metallurgy, and electricity, steady and rapid development is everywhere to be traced. The diamond-boring system has attracted great attention in Bohemia and in Switzerland. The American system of rope-boring for petroleum wells is another novelty in this branch of engineering. The Prussian Government have carried the workings of the Pribram metalliferous mine to a depth of more than 1,000 mètres below the surface, so that this is now the deepest mine in the world. The introduction of tapered steel ropes has been rendered necessary by the great depth to which the mines in question have been carried.

While it will be evident that the first number of these new abstracts is full of information, it may safely be anticipated that their value will increase year by year; and that not so much as an index to actual movement as by way of record. The Transactions of the Institution now form almost the only record that we possess of the history of engineering in England. From their very fulness of matter they are somewhat inaccessible, though the promised completion of the index will do much to remove this defect. The value of a series of annual abstracts is too great to need comment. The only point in which we observe that the abstracts are hardly up to the science of the day is in reference to the electric light, where estimates of the cost which have been long before the public are returned in place of the very different results that have attended the experiments in London and other parts of England. These, no doubt, will be duly chronicled next year. The Gramme and the Siemens machines are still spoken of as the most economical sources of electricity. We shall no doubt have, by-and-by, instructive facts put on record as to the fate of not a few attempts to obtain costless power, whether applied in the shape of light, of heat, or of work actually done. We congratulate Mr. Forrest on his first account of engineering progress in foreign countries.

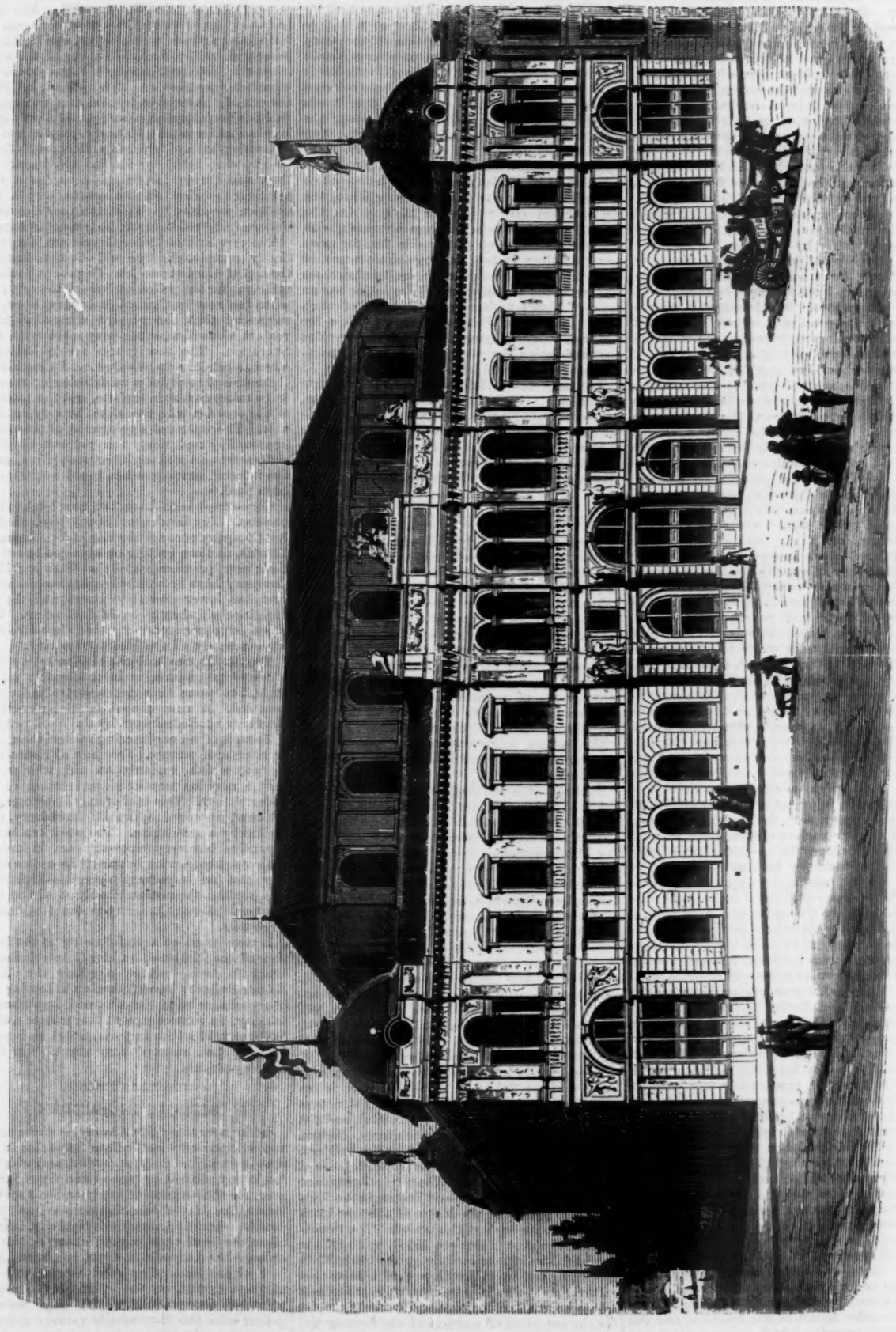
THE INJURIES TO WORKMEN QUESTION IN ITALY.

For a considerable period the question of the liability of masters for injuries received by their workmen during the course of their employment has caused not a little discussion in this country. And already notice has been given that it will occupy the attention of Parliament during the present session.

But it is not only in England that this matter has received much public notice; in Italy, likewise it has come in for a large amount of discussion. In that kingdom, however, its scope is considerably wider, and the character of the discussion shows that many advocate changes in the legal relation of masters and workmen in regard to this matter which have no supporters here, and which, by the fact of their being mooted at all, seem to show that the administration of the law in Italy is much at fault. The subject is one which interests so many classes of our readers that it will well bear some brief notice.

The number of accidents to workmen in Italy seems very large, though no general trustworthy statistics are to be had from official sources. But some figures are available which give, at any rate, a notion of the extent of the injuries received by workmen, and these we take from the pages of a recent number of an able and interesting Italian weekly journal, *La Rassegna Settimanale*. From the year 1872 up to October 31st, 1878, about 1630 workmen were brought to the Hospital della Consolazione at Rome, who had been injured while engaged at their labour. Out of this number 169 died, and the remainder were either injured for a time or for the rest of their lives; and in considering the figures furnished by one hospital only, it must be remembered that there are many other persons taken to other hospitals or treated in their own homes. But in Italy it is not so much the absence of redress when the injured man is maimed or killed by a fellow-workman, which is the main bone of contention in England, but the fact that redress apart from this question is almost out of the reach of the workman, and that consequently masters do not much mind whether their workmen are injured or not. The law, it is contended, is just enough in principle that one man who receives an injury by another, or at the hands of his agent, should have recompense from him.

But, say the friends of the Italian workman, it is almost wholly impossible for him to obtain the redress which is theoretically due to him. Possibly almost a pauper but for his actual earnings,—certainly, at any rate, a very poor



STOCKHOLM ARCHITECTURE: CONCERT ROOMS IN BLASIIHOLMSTORG.

man,—he can hardly afford to obtain legal assistance in the first place, or go through the great expenses of litigation in the next; and finally, it is necessary to prove the negligence of the employer or his servant.

The proposal (which has received not a little support by which all this is to be changed), is to the ordinary Englishman rather startling in its character. For the responsibility for accidents is presumed by the proposed law to rest on the employer, and it is on him to prove either that the injury complained of has been caused by some unavoidable accident, over which no party had control, or else that the reason for it is the negligence of the injured workman himself Thus the whole burden of proof is shifted, and the employer, as soon as the accident takes place or the injury is done, would be in the eye of the law the wrongdoer and liable to pay compensation until he had proved facts to take away the legal presumption. This, we confess, is an innovation which we do not think would be tolerated in this country, nor do we believe that it could fairly be considered in harmony with the principles of justice. No doubt it is often difficult for a poor workman to obtain redress when his legal opponent is richer than himself, but certainly in this country we see every day quite poor men obtain substantial damages from railway companies, one of which is richer than any band of a score or two of Italian master builders combined together in one body. The next proposal is that damages shall be calculated strictly on the base of the wages paid to the operative at the time that he is injured. But what the more advanced supporters object to in the Bill of Signor Pietro Pericoli is that it leaves the ordinary procedure untouched. They would propose an addition very radical in its character, namely a special procedure applicable to this class of cases, by which some public legal body should be the real pursuer, or, as it were, legal trustee of the injured man's interests. We do not for a moment deny that the Italian workmen are suffering under various ills, especially in reference to this matter of injuries received in the course of their employment. But what is astonishing to an Englishman is the fact that no attempt seems to be made to improve the existing laws; but that, instead, a fundamental legal principle is wholly to be changed, and a special and very unusual procedure is sought to be introduced. And, strange as it may seem to us now, there is no reason why some, whose sympathies with the workman are possibly stronger than their appreciation of justice, should not bring up similar proposals in this country. But we say advisedly that there can be nothing more injurious to the real system of justice in a country, or to the proper and various relations between various classes, than to give exceptional privileges to one set of men over another. It would be just as reasonable to make it a legal presumption that if a man is injured in a railway accident it is the negligence of the company, or if a sailor sues a shipowner for wages that they are due unless the master first prove the contrary, as to make it a presumption that when a workman is injured the master or his servants have been, in some way or other, negligent. We are far from having no sympathy with workmen, and during the recent Midland Railway strike we at once stated that we thought hard measures were being dealt out to the men by the employers. But we should regret very much to see what we should consider wholly inequitable remedies proposed in this country which are received as proper by sensible and able Italian writers and politicians. And such schemes seem to us also to point a kind of indirect moral to English workmen, for they show that English workmen have no grievances to complain of in the way of obtaining justice when required; whereas, the mere mention of these plans in Italy shows that the workmen there are baulked at the very gateways of the Courts of Justice. We are not now saying anything in respect to the vexed question of the liability of employers for the acts of workmen by which fellow labourers are injured. All we have done here is to show something of the state of feeling in Italy in the broader aspect of the question, and the undesirable remedies which are proposed in the South of Europe.

The Improved Industrial Dwellings Company.—Mr. Henry Jarvis, jun., of Trinity-square, Southwark, has been elected architect and surveyor to this company. There were 181 candidates for the appointment.

STOCKHOLM ARCHITECTURE.

CONCERT-ROOMS IN BLASIIHOLMSTORG.

STOCKHOLM was long in need of a building in which large numbers of persons might assemble for public meetings or festivities, for concerts or lectures, or for other similar purposes. To supply this long-felt want, a committee was formed some years ago, and the result of its labours was the spacious building of which we give an illustration. The portion of the town on the Blasiiholm, one of the numerous islands on which a great part of the Swedish capital is built, being most centrally situate, was selected for the site. The façade of the building fronts the Blasiiholmstorg, and is 194 ft. long; the side facing the Stallgatan is 175 ft. long. The whole foundation rests upon rock. The edifice rises in four stories,—ground floor, mezzanine story, and two stories above this; the height of the building up to the parapet being 53 ft., the concert-room rising another 27 ft. On the ground floor there is a carriage approach, with spacious entrance on either side for the more humble visitor, as well as large cloak-rooms, in connexion with the upper stories by staircases leading to the concert-room. The latter has an area of 13,400 square feet. A room of such large dimensions, with large rooms below for lectures, meetings, concerts, and so on, provides accommodation for thousands. Refreshment-rooms are also to be found in the building.

The large edifice fulfils all the requirements of public assembly-rooms: central position, convenient approaches, with a large hall of good acoustic properties. The cost of the building is stated at half a million riksdalers (22,000*l.*), for which outlay an annual income of 48,000 riksdalers (nearly 3,000*l.*) is obtained.

BUILDING NOTES FROM BRISTOL.

MUCH has been lately said about the depression in the building trade in nearly all quarters, and the statements as to the badness of things in the West of England has been certainly corroborated by the large number of those either directly or indirectly connected with the business, who, soon after the bank suspension in Bristol, found it necessary to file petitions in liquidation, some for small, but others for considerable, amounts. Notwithstanding this, many works of a rather important character have recently fallen to the share of the local contractors. Some of these have been finished within a few weeks, others are approaching completion, and one or two are making satisfactory progress.

Amongst the buildings entirely completed, Christ Church, Stoke, and Redcliff-crescent Chapel may be noticed. The former is ornamental, and very little expense was spared by the Congregational body, for whom it was erected. The second chapel named belongs to the Bible Christian denomination, in a much less fashionable quarter; its architectural pretensions are not so great as those of Christ Church. The place is spacious, well seated, and lighted. The building cost about 8,000*l.* At two other places of worship near at hand the builders have been at work. On Zion Congregational Chapel, 1,500*l.* have been spent in refitting and thorough renovation, and 300*l.* or 400*l.* have still to be laid out in exterior work; while 1,200*l.* or 1,300*l.* have been expended in erecting new schools attached to Philip-street Baptist Chapel.

Amongst the works nearly completed, perhaps the Grammar School in Tyndall's Park is the most important. The total cost of this structure is nearly 20,000*l.* (inclusive of the site), and the arrangements made by the architects, Messrs. Forster & Wood, and carried out by the builders, Messrs. Wilkins, of Surrey-street, Bristol, are of a satisfactory character. The original grammar school was founded by Robert Thorne, in the fourteenth century, and the design of the new institution is in the style of this period. The dimensions at the ground line are 158 ft. by 68 ft., the height to the terminals of the gables being 90 ft. The east and west fronts are of similar character, and the main entrance-porch on the east side is adorned with niches and carved canopies for the reception of a statue of the founder and others. The lines of frontage are broken up by massive buttresses, which terminate at a line marked with a moulded cornice of freestone round the entire building, with gargoyles above the terminal of each buttress. The walls around the structure are battlemented, the pointed roof is covered with green slate, and surmounted with terra-cotta cresting, and the turrets rising above each transept are features. The building is of red local stone, with freestone dressings. The chief schoolroom is said to be unsurpassed in dimensions by any place of the kind except one at Birmingham, which is a trifle larger. It is 140 ft. long, 50 ft. broad, and 50 ft. high from the floor to the collar-beam of the roof. The class-rooms are also spacious and lofty, and accommodation is provided for 400 or 500 boys. In the upper portion of the west transept it is intended to place a fine organ, costing 1,000*l.*, presented by Mr. W. H. Wills, one of the school trustees. The head-master's house stands in a prominent position on high ground, adjoining the school. A cricket-field of four acres and a half has been levelled close by, and ample space is retained for a school library, gymnasium and swimming-bath. Tyndall's Park will before long become noted for its fine buildings. The Deaf and Dumb Institution occupies a commanding position on the estate, and it is in addition proposed to build the new University College (referred to in our last) near at hand.

The new Bristol Police Courts are also practically completed. The old Council-house at the top of Corn-street has long been found insufficient for the police business of the city; and when the new institution is entered upon, it is suggested that the present somewhat inconvenient Council-chamber may meet with some alteration. The new courts are in Bridewell-street, next door to the Central Police Station. Extensive property of a valuable description had to be taken to obtain the site, and the total cost of the erection will, therefore, be very considerable. The external appearance of the place is unassuming and neat, and yet not devoid of ornamentation and architectural effect, and to the internal arrangements much attention has been paid.

Corn-street is to have two new banks at two corners. The London and South-Western Banking Company secured the site of St. Werburgh's Church, and are getting on at a good pace with their new premises; and the Wilts and Dorset Company have demolished extensive commercial premises lower down the street, and the fresh buildings will shortly be in full swing. When these structures are completed Corn-street will possess nearly all the banks of the city.

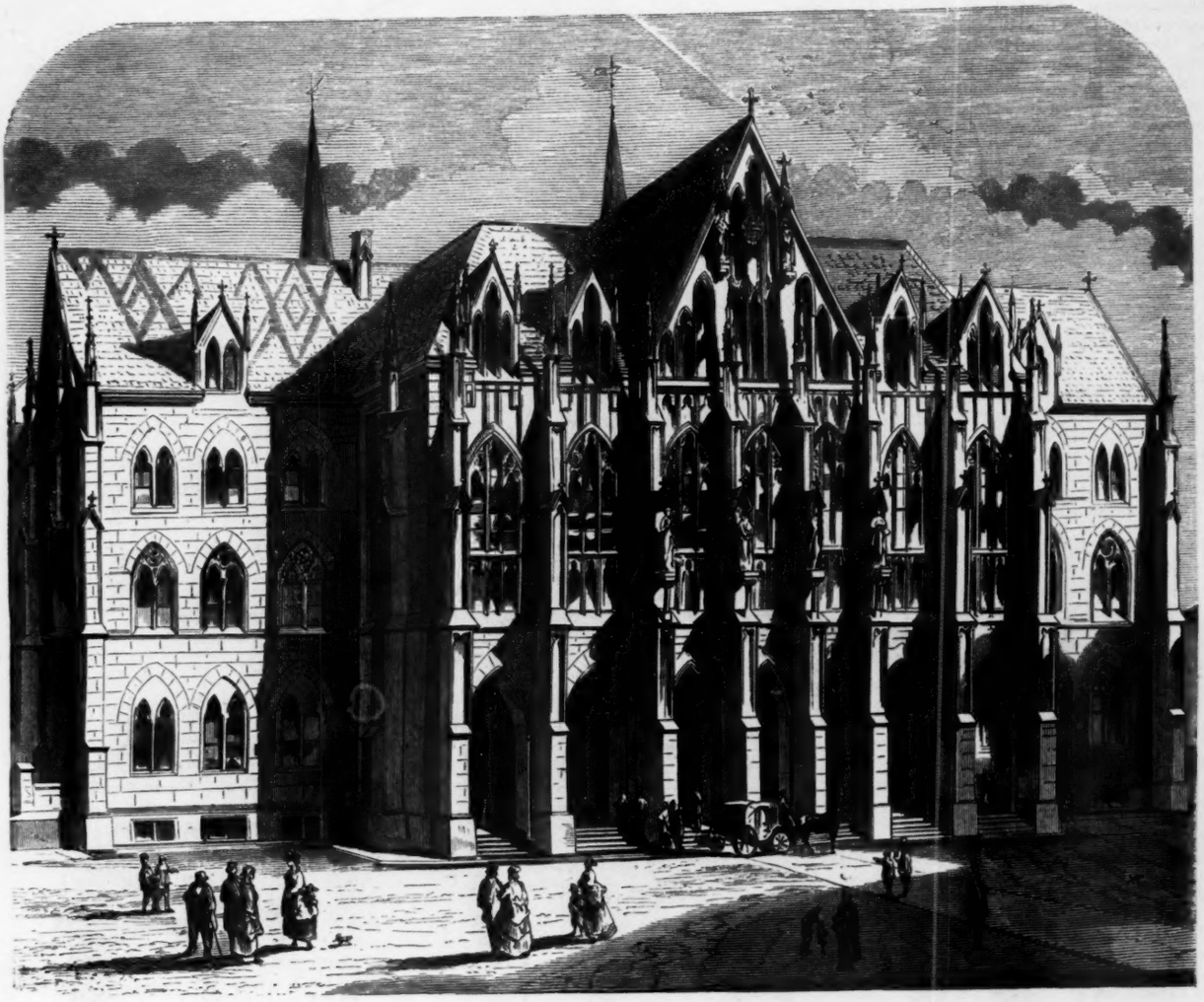
The St. Raphael's House of Charity, a scheme of some magnitude, is in a tolerably forward state, but some time must elapse before it is occupied. A new chapel is to be erected in North-street, Bedminster, by the Wesleyan body.

Though of an engineering rather than of an architectural nature, the new Princes-street Bridge, which replaces an old wooden toll-bridge, may be mentioned in treating of local undertakings. This is of iron. It swings, with the most approved hydraulic machinery, set in motion by a gas-engine. The work has been an expensive but very necessary one, in order to open up a connexion between the centre of the city and an important suburb,—Bedminster. The city had to purchase the right of the Great Western Railway Company to the foot and carriage tolls.

It may be added that, following on the formation of the National Builders' Association, an effort is being made to place the Bristol Master Builders' Association on a footing more in accordance with the size and importance of the city. In connexion with this matter a dinner has been held at the Imperial Hotel, an imposing building just erected near the Clifton Down Railway-station.

SCHOOLS IN DRESDEN.

IF in a country like Saxony,—whose schools and educational institutions have for a long time been looked upon as models, and which are frequently visited by schoolmen from far and near, for the purpose of studying their arrangements, the plan of teaching pursued, and other details,—her capital and principal city, Dresden, takes the lead with a good example, this precedence has its reason, on the one hand, in the fact of its possessing good educational establishments, and, on the other, in the requirements of the population of a large town, together with the increasingly various claims for a superior education demanded by our times. Although there is more of the will than the way at the present time for executing improvements, nevertheless they are constantly being effected, new buildings are erected, and additions to the subjects taught are made. Besides providing for the intellectual development of youth, their physical welfare is also well looked



THE "KREUZSCHULE," ON THE DOHNAPLATZ, DRESDEN.—PROFESSOR ARNOLD, ARCHITECT.

after in the Dresden schools, gymnastic exercises being an obligatory branch of instruction, and training institutions for teachers of gymnastics having also been established.

While formerly the school-going youth of Dresden had to spend a great part of the day in dark, dreary rooms, now buildings on a scale ample in every respect, embodying and fostering the principles of human well-being: air, light, and heat, are being raised everywhere. To give only two striking examples of the schools of Dresden, we may mention the Kreuzschule, on the Dohnaplatz, and the Annenrealschule, in the Neue Humboldtstrasse, of the former of which we present our readers with a view.

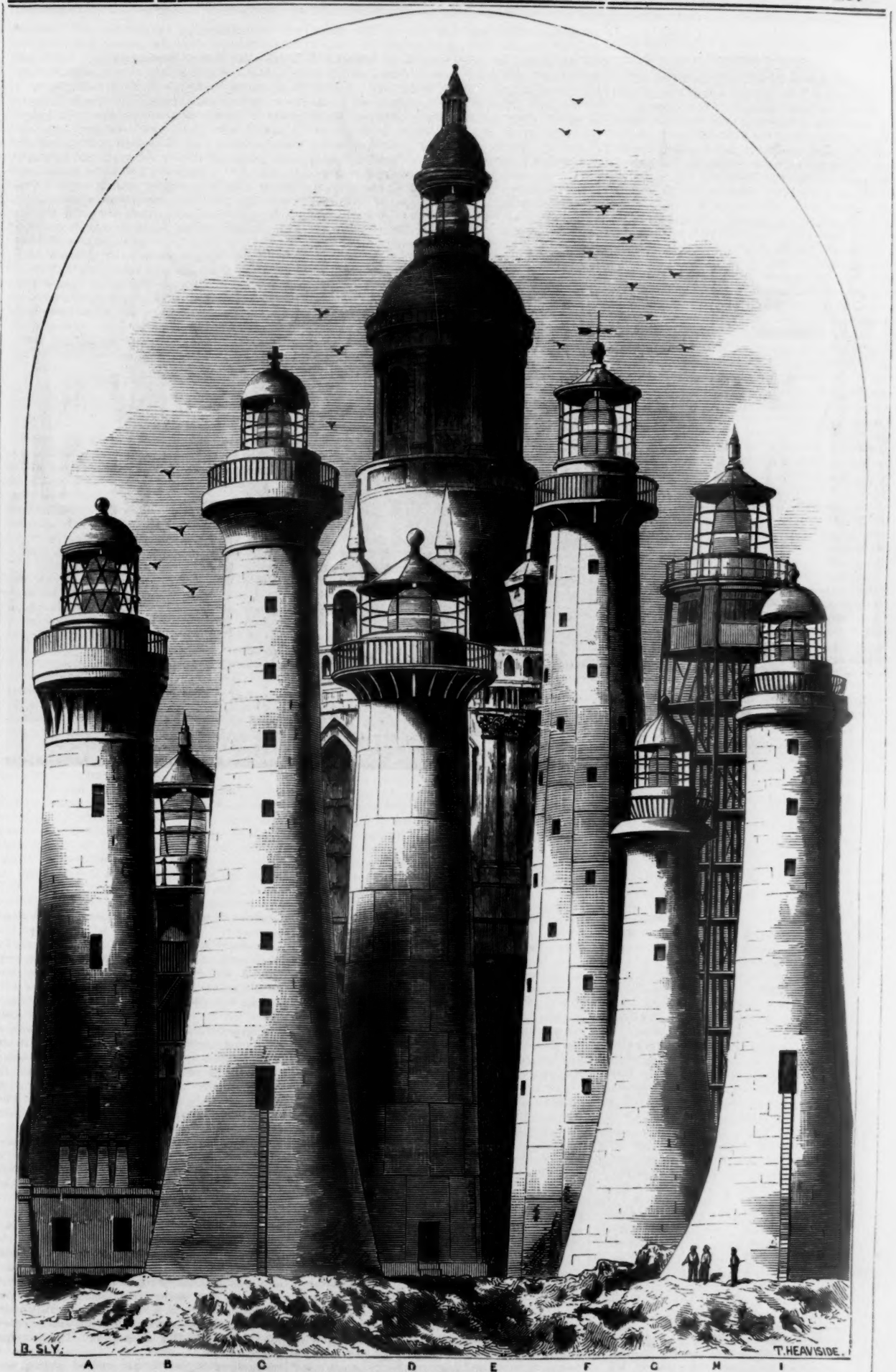
In the erection of new schools, provision has naturally been made for the gradual increase in the population and the extension of the city. In comparing the number of about 9,700 pupils who visited the various Dresden schools of all descriptions in 1845 with the number of scholars in 1868, which in that year, in three middle-class, nine district, and five parochial schools,—and without including those in the numerous higher schools and private institutions,—was about 14,000, it may be said that during that period the number of scholars has been doubled, the population of Dresden having in the latter year risen to 150,000 souls.

Without being able to enter into details respecting the various excellent public and the private institutes, it may be mentioned that,—besides the two high-class schools above referred to, the excellent so-called Freimaurer-Institut (Freemasons' Institution), in the suburb of Friedrichstadt, the Realschule of Director Zschoche, the Realschule in Neustadt, the institution and boarding-school of Director Krause, especially visited by foreigners, the establishments of Director Böhme and recently of Dr. Hölbe, and many other private institutes, and several Protestant and Roman Catholic free-schools,—Dresden possesses in the Vitzthum-Blochmann Gymnasium an institution which is frequented more particularly by princes and the sons of the upper classes. No less known are the Kreuzschule (to the architecture of which we shall recur below) and the Annenrealschule; the seminary for teachers in Friedrichstadt, founded about 1787; the much frequented Polytechnic School, three Veterinary Colleges, as well as the Flechter Seminary, established in 1818, but founded already in 1769, by a gift of Lady Flechter, its definite establishment being delayed by the claim of Prussia to this foundation, the bequeathal of which fell in the time before the partition of Saxony. The Building Trades' College, in connexion with a Sunday school; the greatly frequented Trade School of Director Clauss; two commercial colleges; the preparatory institute of Lieutenant Neumann, for candidates for commissions in the army; the establishment for the nursing and reforming of children; institutions for the blind and deaf and dumb; and the Conservatorium of Director Pudor, connected with which is a dramatic college, are merely referred to by the way, similar establishments being found in nearly all larger towns. A more detailed discussion of the administration and organisation of schools and educational establishments is not within our scope; but we may, for the sake of completeness, just refer to the institution of Dr. Pietsch, which is situate in a healthy and picturesque spot at Blasewitz, near Dresden, and comprises three preparatory and two higher classes.

In the erection of the new district schools in the suburbs of Pillnitz and Oppelvorstadt, and that of the Stiftsstrasse, regard is paid, as already referred to, to the requirements of the population, increasing from year to year. Those schools are not only of great size, they are also suitably, in parts richly, adorned both exteriorly and in the interior. This circumstance by itself reflects credit upon the city and the architects; it likewise serves the useful; for unconsciously the impressible nature of children will become acquainted with fine lines, forms, and proportions, and these will act beneficially on their æsthetic feelings.

The handsome gymnasium on the Dohnaplatz, in the Gothic style, with high windows in the middle portion, slender buttresses, and artistic decoration, is the work of Professor Arnold.

The area occupied by the building is about 24,000 square feet, there being, besides, a playground for the scholars and a garden for the teachers. The class-rooms are on the east side of the building, the *aula* facing the Dohnaplatz, and forming the projecting middle portion, which, on the ground-floor, constitutes an open entrance-hall, with a rich façade. This story also includes steward's rooms, and various offices, dining-hall, and five class-rooms. The principal staircase, 14 ft. wide, with its balustrade of open sandstone work, its groined ceiling, and the pretty capitals, as well as the corridors to the right and left, presents a picturesque perspective. On ascending it, on the first-floor, the principal hall, 60 ft. long, 38 ft. wide, and 30 ft. high, lighted by five high windows, is



A GROUP OF LIGHTHOUSES.

A. Lighthouse at Ardnamurchan Point, Argyllshire. B. Wrought-iron Lighthouse on the Dædalus Reef, in the Red Sea. C. Lighthouse on the Skerryvore Rocks, on the coast of Argyllshire. D. Iron Lighthouse at Cape Pembroke, Falkland Island. E. Tour de Corduan, on a reef at the mouth of the River Garonne, Bay of Biscay. F. Lighthouse at Plumb Point, Jamaica. G. Eddystone Lighthouse. H. Wrought-iron Lighthouse on the Ushruffee Reef, in the Strait of Tubal, in the Red Sea. I. Lighthouse on the Bell Rock, Scotland. (All are drawn to one scale.)

[See p. 243.

reached. On each side is a spacious balcony for the choir, and underneath each are side-rooms. The groins and transverse arches are simple, but well membered; the decorative painting, in conjunction with the gilded capitals and bosses of the vaults, notwithstanding the great display of colours, produces an agreeable effect. The spandrels are decorated with frescoes. Into the corridor, besides five class-rooms, each calculated for from forty to fifty pupils, open three rooms containing the library. The second story comprises the residence of the rector, and four large class-rooms, while the attic story contains living and sleeping rooms for the pupils, residence of the inspector, patients' rooms, and rooms for singing-classes.

The building is of sandstone, of a yellowish tint, the carving being in white sandstone. The buttresses of the middle portion are adorned by statues of Luther and Melanchthon, as well as representations of Poesy, History, Grammar, and Mathematics.

The cost of erection was only 12,000*l.*; but this occurred several years ago.

THE ELECTRIC LIGHT IN THE BRITISH MUSEUM.

WHEN we wrote a few months ago on the practicability of using the electric light in public libraries, museums, picture-galleries, and other art collections, perhaps no one would have thought it likely that, of all our public institutions, the British Museum would be the first to admit the new lighting agent to a practical test. There were several reasons against the adoption of such a step, but we need only point to what was urged as the principal. The British Museum is a vast storehouse of priceless treasures, priceless because by far the greater portion of them could not be replaced, should destruction ever overtake them. Jealously guarding the valuable objects confided to their care against annihilation from such a cause, the Museum authorities have hitherto resolutely, and very properly, resisted, and still resist, the introduction of gas. It is a high testimony to their liberal views that they have opened their portals to experiment when experiment is possible, and with a lighting agent acknowledged to be entirely free from danger, and which they may therefore safely adopt without apprehension as to probable consequences.

The few who were present last week on Tuesday and Thursday evenings in the Reading-room to witness the display of the electric light must have left it with the impression that the experiment, so far as experiments go, was highly successful. It was fully demonstrated, we think, that the Reading-room of the British Museum is a space particularly suitable for lighting by electricity, and those present must have been greatly impressed with the softness and beauty of the light for study. It has been objected that the electric light is injurious to the eyes. We are not aware that there exists any medical testimony to this effect; in fact, this is a matter which invites investigation, for experience we have not had yet, the electric light being still too "young."

The arrangements in the British Museum may be noticed in a few words. There were altogether twelve lamps placed on standards about 15 ft. high,—a height which, we think, ought to be reduced to about 10 ft. As no perceptible heat is emitted, and the glare is not excessive, we cannot see the object of placing the lamp at such a distance, which must reduce its illuminating power. The standards, we further think, will have to be placed above every partition dividing the desks. The shadows thrown by such a powerful light are necessarily very dark, and ought to be avoided. Small print could not be read with ease sitting at the intervening desk above the partition of which no lamp was placed; and this would be quite impossible with the back turned full to the light, the shadow thrown being so dark. There was another peculiarity which was noticed, and this was a curious humming noise, not nearly so loud as the "roaring" of gas when turned on too full, but quite audible enough to become unpleasant, if not positively disturbing, by its continuance.

In looking at the experiment, it is pleasing to reflect how many doors the admission of the electric light into our museums and public libraries may open. Taking the British Museum as an example, at present it is open only for a few hours each week-day, Sunday being still a *dies non* for æsthetical enjoyment. In consequence, the Museum is only frequented by holiday folks, *i.e.*, people out for a holiday, and visitors from the country or abroad. The hours of the Reading-room are about the same, and a student who has to earn his daily bread during such hours as the Reading-room is open finds that the splendid library is almost closed to him,—though he may have the privilege of entering it,—unless he is willing to make a sacrifice. The gratefulness with which an opening of the library in the evening would be welcomed by that class of students can only be equalled by the great benefits with which such an opening would be accompanied.

THE "MANSEL" WINDOW IN ST. PAUL'S CATHEDRAL.

SIR,—It is more than a little disappointing, from time to time, as objects are added as intended embellishments to the metropolitan Cathedral, that it should be found, to adopt the words of a recent critic, that they are "quite distinct from works of art."

I have just been into St. Paul's to see the "Mansel" window in the north-west chapel. A first view makes one sigh at the absorption of a capital position by another object of mere manufacture "quite distinct, &c." The general weakness of the design would be extenuated if some relief could be found in the details; but these, unfortunately, in greater part, are worse than the whole. I avoid raising the question of the propriety of filling so much of the field of the window with unmeaning quasi-architectural members, as this would lead to a separate argument; but about the way these members are elevated, it is sufficient to remark that they appear to have been set out by some draughtsman accustomed to *think* in Classic form; and that he has expressed himself as best he could in these unfamiliar figures. The feebleness and poverty of the ideas are pitiable. As a "St. Thomas" window it might have been supposed that the figure of that Apostle would have been an especial object of careful and studied design. Let any one gaze at the face out-of-drawing, the eye out of place, and, for very sadness, repress a laugh (if he can) at the wretched object they have made of the incredulous saint! St. Thomas has suffered unfairly, in my opinion, the objurgations of centuries. But a cartooned caricature by one of the leading glass-painters in England is an indignity his memory might have been spared. The other principal figures will not bear examination. The left leg of the Saviour is a fearful member. All these parts should be, unhesitatingly, condemned, knocked out, and re-painted.

The "scene" on the window is misplaced; it should be a foot or two higher; and thus would allow for a base of more decided character. The under panel is, perhaps, the most puerile thing of its kind to be found in the windows of the building. The colour of the window is patchy; and, generally, wanting in refinement, glassiness, and purity. With such magnificent and well-known examples, close to our shores, as those at Brussels, in the "Sacrament" chapel, and the exquisite lights at St. Jacques at Liége, it is intolerable that our modern painters should persist in repeating these barren "art" manufactures.

The window has one merit which should be, ungrudgingly, allowed. It most effectually darkens the atrocious mosaic placed in the chapel a year or two ago, to the memory of Archdeacon Hale. This coarse production, fit for the façade of a terminus or a tavern, is now, happily, almost obscured.

The whole matter, sir, has a serious interest. Is it really to be supposed that a window like this has passed the scrutiny of such a veteran as Mr. Penrose, the cathedral surveyor?—a gentleman known, and valued wherever known, for his learning and acquaintance with every form and phase of Classic art. Or, is it that these things are relegated to the cumbrous examination of the "committee," who are supposed to be "sitting" over successive incubations of these permanent encumbrances?

There has just been formed, I am told, a "St. Paul's Ecclesiological Club." I would suggest to them to commence their exploitations with a candid criticism of the modern inanities perpetrated in the name of "art" within the magnificent fane just before their eyes.

J. J.

THE RAILWAY, TRAMWAY, GAS, AND WATER BILLS.

THE Report of the Board of Trade upon all the railway, tramway, gas, and water Bills to be investigated during the present session of Parliament has just been issued, and from this document we find that the Bills relating to railways, which are 98 in number, involve the construction of 458 miles of additional railways, at an outlay of 19,387,636*l.* Of the entire number of Bills, 74 are promoted by existing companies, for the construction of 248 miles, with a proposed capital of 11,513,870*l.*, of which 8,594,000*l.* are by shares, and 2,919,870*l.* by loan. Of the whole of these Bills, 52 relate to England, 9 to Scotland, and 13 to Ireland. The proposed expenditure on these works in the three countries is 10,301,570*l.* on lines in England, 514,000*l.* in Scotland, and 698,300*l.* in Ireland. The Bills promoted by the new companies are 24 in number, for the construction of 206 miles of railway, at an outlay of 7,873,766*l.*, of which 5,906,000*l.* are by shares and 1,967,766*l.* by loan, thus bringing up the proposed expenditure by existing and new companies to 19,387,636*l.*, as above stated. Twenty of the Bills promoted by the new companies are in respect of lines in England. More than four-fifths of the amount proposed to be raised and expended by existing companies is by twelve of the great railways in England and Scotland, the amount of capital sought by the Bill of the London and North-Western Company being 2,003,000*l.*; by that of the Midland Company, 1,200,000*l.*; the Manchester, Sheffield, and Lincolnshire, 666,000*l.*; the London and Brighton, 573,333*l.*; the North British, 444,000*l.*; the London, Chatham, and Dover, 400,000*l.*; the South Eastern, 133,333*l.*; the Taff Vale, 133,000*l.*; the Teign Valley, 133,000*l.*; the East Norfolk, 166,000*l.*; the Yarmouth and North Norfolk, 210,666*l.*; the Metropolitan and Metropolitan District, a separate capital for the completion of the Inner Circle line, 3,300,000*l.*; and twenty of the other existing companies, 2,151,538*l.*, making the total 11,513,870*l.* The report goes on to observe that with the exception of the new lines proposed for connecting the Metropolitan and Metropolitan District Railways, which form a very large item in the new capital, the new mileage proposed by existing companies appears to be designed more for the relief of traffic on certain lines than for affording railway accommodation in new districts. A very large proportion of the proposed capital by these companies is for additional works, improvements required at stations, and for the widening of lines, matters which have become necessary by the requirements of the traffic, and for the better accommodation and safety of the public. The report states that the most important of the Bills by new companies is that of a railway for completing the inner circle, between the Mansion House Station and Aldgate-Station, and is consequently a competing scheme with that proposed by the Metropolitan and the Metropolitan District Companies. The capital proposed for this competing scheme, which provides for connecting the South-Eastern Railway at Cannon-street with the Metropolitan District line, and the London and Blackwall Railway at Fenchurch-street with the Metropolitan line at Aldgate, is 4,000,000*l.* for a line one mile and sixty-two chains in length; whereas the capital for the line jointly promoted by the Metropolitan and Metropolitan District Companies is 3,300,000*l.*; the proposed connecting line between the Mansion House Station and Aldgate, and also with the East London line in Whitechapel, being two miles and ten chains in length.

The Report shows the number of Bills which relate to tramways to be 33, for the construction of 209 miles of tramway at a cost of 2,752,000*l.*, of which 2,070,500*l.* is by shares, and 681,500*l.* by loan. Nearly the whole of the Bills relate to proposed tramways in England, there being 27 schemes for the construction of 174 miles, whilst there are three Bills for making 22 miles in Scotland, and three for 13 miles in Ireland. In addition to the above-named Bills, however, there are 32 Board of Trade applications for Provisional Orders to construct 57 miles of double-line tramways, and 90 miles single-line, in different parts of the country, at a cost of 901,342*l.*, making the total length of the proposed tramways 356 miles, and the outlay 3,653,342*l.* The Report observes that the number of Bills and the amount of capital proposed are about double that for the session of 1878. Several of the Bills provide for the use

of steam for working the tramways, and one Bill proposes the use of underground wire-ropes, and stationary engines.

The number of Bills which relate to the supply of gas is 39, the proposed capital for which is 2,068,100*l.*; in addition to 10 Board of Trade applications, with a proposed capital of 180,425*l.*; total in respect of gas 2,248,525*l.*

The number of Bills in respect of a supply of water is 24, of which 20 are in England, and the proposed capital is 5,759,650*l.* There are also 11 Board of Trade applications, involving a proposed capital of 203,000*l.*, being a total capital in respect of water-supply amounting to 5,962,650*l.*

There are also 24 Board of Trade applications in respect of gas and water supply jointly, the proposed capital for which is 118,750*l.*

The total number of Bills in respect of railways, tramways, gas, and water, is 194, with a proposed total capital of 29,967,386*l.*; in addition to 56 Provisional Orders in respect of tramways, and gas and water, with a proposed capital of 1,403,517*l.*; the aggregate proposed capital in respect of the various projects being 31,370,903*l.*

THE FRACTURE OF WROUGHT IRON.

CIVIL AND MECHANICAL ENGINEERS' SOCIETY.

THE following interesting paper, by Mr. James Love, F.R.A.S., was read (in the absence of the author) by Mr. R. M. Bancroft, at a recent meeting of the above society:—

We occasionally have our attention called to the deterioration of the material of which bridges and girders are made, and the chief cause of such deterioration that is usually pointed out is the gradual change of iron into rust, or oxide of iron. This change is one that can be watched from time to time, and the parts affected can be taken out and replaced when found to be so much weakened as to render them unsafe.

I should like to call your attention to another cause of decay, which does not usually receive much attention, probably because its action is not seen, but which will ultimately destroy a great number of bridges, and especially railway bridges. I allude to the decay that is caused by long-continued vibrations, and the frequent changes in the amount and distribution of stress in girders, due to heavy loads passing over them.

When a piece of wrought iron is broken, the fracture presents an appearance which depends upon several conditions, such as the quality of the iron, and the way in which it is broken. If the iron be of good quality, and it be broken by a pressure applied slowly and gradually, the fracture will present a silky, fibrous appearance. If breakage be caused by a sharp blow, the fractured surface will usually show a number of bright, shining facets, lying in planes forming angles of no very great amount with the mean plane of fracture. When iron breaks in the manner last mentioned, it is said to be "crystalline." Iron does not always need a sharp blow to produce this so-called "crystalline" fracture; but will often show it when broken in other ways. For instance, when a piece of iron forming a part of a machine has been long in use, and has been subjected to a great deal of concussion, it will, not uncommonly, break, and the fractured surface will present this appearance. Pieces of iron that are subjected to many alternations of temperature will suffer in a similar manner. This change in the apparent structure of iron is generally explained by a theory in which it is assumed that there is some sort of rearrangement of particles by which the original fibres are converted into crystals, and hence it is said that the action to which the material has been subjected has developed a crystalline structure. Now this to my mind is not a very satisfactory explanation; and I venture to offer a theory which appears to me to be much nearer the truth.*

In North Wales, and some other countries where old geological formations abound, there are rocks that split in parallel planes. These planes, which are called cleavage planes, have no sort of relation whatsoever with the lines of original stratification of the rocks, but may lie in any direction with respect to them. This curious structure is known by the name of slaty cleavage, and used to puzzle the philosophers a great deal. Several theories were formerly put forward for its explanation, but were set at rest when Professor Tyndall showed how cleavage could be produced in wax, clay, and other substances, simply by the application of great pressure. The theory which is now accepted is that slaty cleavage was produced by great pressure acting in a direction perpendicular to the planes of cleavage; and the evidence in the rocks themselves fits in with this theory. A substance possessing this structure may be split into a number of thin plates by the insertion of a thin wedge between any pair of plates. Crystals may be split in a similar manner; for cleavage is one of their properties. They may also be split by a sharp blow. Some of them may be more easily split by the application of heat. The cleavage of crystals has not been satisfactorily accounted for; but it appears to have some connexion with the molecular forces that helped to give the crystals their peculiar form. It would not be difficult to show that the several methods of splitting crystals are merely different modes of pressure. For instance, a thin wedge pressed in between two laminæ exerts a side pressure in a direction perpendicular to the plane of cleavage, and causes the crystal to split along that plane. A blow delivered upon a crystal causes a wave of pressure to travel rapidly through the crystal. This wave, carrying with it a local pressure which acts between neighbouring particles in succession, overcomes the cohesion of the particles along the plane of least resistance, and causes the crystal to separate along that plane. Again, crystals that are split by the application of heat owe their splitting to the same cause; for a crystal placed in the fire cannot possibly be heated throughout its entire substance instantaneously. It must necessarily take time for the heat to be transmitted from particle to particle. Neighbouring particles will therefore be at different temperatures at the same time; and, since bodies expand with the rise of temperature, it follows that these neighbouring particles at unequal temperatures must exert pressure against each other. This pressure being of a local character, sets up two kinds of stress, viz., a compressive stress among some particles, and a tensile stress among their neighbours, and thus loosens the cohesion of the particles, causing the crystal to give way along those planes in which the cohesion is least; that is, along the cleavage planes.

So much, then, for the cleavage of slates and crystals. But what has all this to do with the fracture of iron? This. You cannot produce a crystalline structure in iron, for the crystals are already in that metal after it is reduced in the puddling furnace, and are drawn out into fibres by the action of the rolling-mill. The silky fibres that are observed when good iron is broken slowly are, in fact, the crystals; and the bright facets that are seen when sudden fracture takes place are the cleavage planes along which the crystals have separated. Such a fracture as the latter would, therefore, be more properly called a cleavage fracture.

Cleavage, then, is latent in wrought iron, and only wants the necessary conditions to bring it it into full development. These conditions often exist, and cleavage is constantly being developed in wrought iron that is in ordinary use. It may be observed in foundries, where iron rods, hooks and chains, that are used for lifting hot castings, are, in time, weakened to so great an extent that they break by the application of a very small stress, or by a very light blow. A more homely illustration of this kind may be cited in the case of an old poker. Most of us have seen an old poker, bearing the evidence of a great many heatings in the fire, break just behind the square part when used as a lever for poking the fire. If the fractured surface of such a poker be examined, it will be found to possess the characteristic appearance of the cleavage of iron. In forges where there is a great deal of thumping going on, some parts of the machinery have to bear a large amount of concussion. The parts so affected are found to last but a very short time, for they break by cleavage, and have to be replaced by new parts, which, however, go to destruction in a similar manner. A smith is careful to have his iron sufficiently hot whilst working it, for he knows by experience that if he work it at too low a temperature it will split under the blow of the hammer. It is observed that iron rails suffer from thin laminæ peeling off their upper surface.

Now, all these are instances of fracture by cleavage which has been for the most part, if not entirely, developed while the iron has been in use. The last instance cited may be worth considering. In this case the pressure is applied to the rail by the wheels of very heavy engines; and since only a small portion of a wheel is in contact with a small part of the rail, it follows that a large pressure bears upon a very small surface. As a result, the iron separates along a plane perpendicular to the direction of the pressure. It is noteworthy that in this case the separation is caused, not by *tension*, but by *compression*, and in this respect resembles the case of slaty cleavage, where compression is also the cause of separation.

There are other cases in which this cleavage becomes of the greatest importance, and in which it sometimes leads to the most disastrous results. The wheels of railway carriages demand constant attention; for it is well known that, however strong they may be when new, they ultimately come to destruction. Cleavage is the means of their destruction. All locomotive engines have a careful record kept of the number of miles they run; for it is known that there is a limit to their running distance. This limit has rather a wide range. Some engines will run a far greater distance than others; and the lowest limit is taken at which an engine is overhauled to ascertain whether it shows any signs of weakness. Perhaps the part that receives the most careful attention is the driving-axle. This axle will sometimes exhibit a crack after running a certain number of miles. In some cases the crack is longitudinal, in other cases it is transverse, and in others again it is both. Sometimes a crack will begin in that portion of a shaft that is inserted into the boss of the wheel, and will run along the shaft until it reaches some part or other of the journal, where it will take a sudden bend round the shaft. When a crack is found, the shaft is, of course, taken out and a new one put into its place.

Now, all these instances, and many others too numerous to mention, are cases of cleavage, and it becomes an interesting question to ask how long does it take for cleavage to do its work? If it be left to time alone the question will probably be left unanswered; for I believe that pure time (that is, the lapse of time without the operation of any forces whatsoever) has very little to do with the matter. By closer observation we find that fracture is brought about by a great many alternations of stress; that these wheels and axles are, in fact, broken by a very large number of applications of a weight or load. The question resolves itself, then, into, How many applications of the load are necessary to bring about fracture? This question cannot be handled with such mathematical exactitude as to give an answer for the case of any given piece of iron. We cannot with our present knowledge formulate for the length of time any particular piece of iron will last any more than we can say when any particular boiler is going to burst, or how long any particular man is going to live. All that we can do is to examine the evidence furnished by experiment and experience to see if any sort of general answer can be found.

In the *Philosophical Transactions* for 1864, the late Sir William Fairbairn published an account of some experiments that he made upon a wrought-iron plate girder with the object of answering this question. In those experiments, he had a machine for putting on a load and taking it off again at the rate of about eight changes per minute; and he found that with 596,790 changes of a load equal to one-fourth of the breaking-weight of the girder, followed by 403,210 changes of a load equal to two-sevenths of the breaking-weight, and by 5,175 changes of a load equal to two-fifths of the breaking-weight, the girder broke at a short distance from the middle. The girder was then repaired and subjected to 3,150,000 changes of a load equal to one-fourth of its breaking weight without suffering any apparent injury. After this, the load was increased to one-third of the breaking-weight, and the girder broke with 313,000 changes of the load. From these results, Sir William inferred that a girder would be safe for a great number of years if it were not loaded beyond one-fourth of its breaking-weight. His inference is no doubt correct.

* Although this theory will be strange to most of our readers, it is worth careful consideration. We believe that Mr. Love,—who is a geologist as well as a civil engineer,—has devoted a great deal of thought to this subject, and his views thereon were partially expressed in a paper on "The Optical Expression of Stress," read before the same Society two years ago, and printed in the *Builder* at the time (vol. XXXV., p. 188). Mr. Love is now engaged in conducting an extensive series of tests of iron, and so far as they have gone we understand that they have confirmed his views as expressed in this paper.—ED.

It must not, however, be supposed that this or even a smaller load can be applied an indefinite number of times without endangering the structure which receives it; for such a supposition would be contrary to the evidence furnished by experience. The instances cited above (and many others might be given) are sufficient to show the destructive power of the frequent change of load.

Referring to the case of locomotive engines, I find that about twelve million changes of a load, that is, far less than one-fourth of the breaking-weight, are enough to cause the destruction of an axle; and it is well known that locomotive axles are made of the best possible material. Now the action of the load on locomotive axles is vibratory, and somewhat concussive; and is very closely similar to the action of the moving load on girders over which engines run. Therefore, since this action is so destructive to axles and wheels, it may be very reasonably inferred that it will be also destructive to the bridges over which they run. It may be objected that bridges, being heavier than engines, will, on account of their greater inertia, be less affected. To this can be answered that bridges may be heavier than engines; but the *parts* of a bridge are not necessarily heavier than the *parts* of an engine. Indeed, in many cases, if a cross girder were balanced against an axle and a pair of wheels, the advantage would be in favour of the latter. Again, from the high numbers given above, it will very likely be remarked that we need not feel at all concerned for the safety of our bridges, since it must take a great number of years to apply the load so many times. True, but it should not be forgotten that these high numbers belong to comparatively small loads; whereas, the greater loads have much lower numbers. Furthermore, when the earlier bridges were built, engines were not so heavy as now, and it was not supposed that they would ever attain their present weight. The older bridges, therefore, that were designed to carry the heaviest weight of their time have now to do a heavier duty; and it must not be expected that they can go on doing this extra duty for any great length of time. Besides, many of the older bridges were designed at a time when the distribution of stress was not so well understood as it is now, so that girders were not made of uniform strength. Some parts were made too strong, while other parts were made too weak; so that the weak parts have more work to do than they ought to have. This in itself is an element of danger. It is now well known that when a beam is made too strong in any part, and too weak in another, the weaker part suffers more than it would if there were no stronger part; for when there is a want of uniformity of strength there is a concentration of vibrations in the weaker part; consequently a beam that is constructed in this manner is more likely to fail than if it were made too weak throughout. This is, of course, defective construction, and leads to a few words about defective attachments.

Perhaps the most important of these is the attachment of cross girders to main girders. Take the case of cross girders resting upon the lower flanges of the main girders. The usual way of doing this in bridges of short span is either to continue the angle irons around the ends of the cross girder and rivet them to the web of the main girder, or to rivet short pieces of angle iron to the webs of both. For a bridge carrying only a single line of rails, this arrangement will do very well. Where there are two or more lines of rails, the rivets which hold a cross girder under one line of rails also hold a cross girder carrying the next line; and this method of attachment is repeated at the ends of cross girders abutting against each other sometimes to the extent of three, or four, or even half a dozen in succession. See now, what is the result? There are half a dozen distinct girders, each designed to do the duty of an independent girder, strung together and forced into doing the work of one continuous girder; a work for which they are not at all fitted. When attached in this way the greatest stress comes on the point of attachment; not, as is commonly supposed, at the centre of span; and since there is no adequate provision made for receiving the stress at that point, the elastic reaction, instead of being uniformly distributed, as it ought to be, over the whole girder, is very largely concentrated on the weak point. A girder which concentrates its stress in this manner is in a very poor condition for receiving shocks or vibrations of any kind, and is not at all fitted to endure the constant work of a heavy railway traffic. It is no use attempting to remedy the evil by putting in extra rivets; for if by so doing the part be really strengthened it will only shift the work on to the next weak part, and perhaps make matters worse than before.

Now, this is no mere fancy sketch of what might happen; it is an illustration of what really does happen in a great number of bridges, and will in time make them very dangerous to travel over. I could point out certain bridges in which this action has gone on to such an extent as to cause the cross girders to separate from the main girders to which they had been attached. These cross girders were so securely riveted to the main girders that the rivets remained entire while separation occurred by tearing through the webs of the cross girders very near their attachment to the main girders. These cases were fortunately discovered in time; but had it not been for the vigilance of the platelayers, who found a deflection in the rails, the consequences might have been very disastrous.

The defective method of attachment pointed out above can be avoided, to a great extent, in designing future bridges, by a different arrangement of the cross girders. Instead of arranging them to meet each other to be riveted together with the same rivets, it would be better to make them miss each other to the extent of half their distance apart. By this arrangement there would be sufficient length of web between one girder on one side and the next on the other side to accommodate, by its elasticity, the small amount of horizontal displacement caused by the deflection of the cross girder when a load is passing over it. In the present way of arranging the cross girders to meet each other there is not sufficient range of elasticity in the fastenings to allow for the deflection; hence the undue amount of stress brought on the ends of the cross girders. Other methods might very easily be pointed out, but it is unnecessary to trouble you with any detailed descriptions of construction, since plenty of good methods of attachment will suggest themselves to the minds of any engineers who will take the trouble to think about the matter.

I would in conclusion strongly recommend that all the older bridges and girders be carefully examined to see whether they are in a condition to bear without risk the heavy work that is imposed upon them now.

THE SPRING RAILWAY DIVIDENDS.

THE spring railway dividends have now been declared on fifteen principal lines of England and Wales. The result is such as to give a new and somewhat unexpected proof of the financial elasticity of our railway system. There has been, on the half year, a decline in gross revenue, on the aggregate of the lines in question, together with the Caledonian and North British (of which the dividends are not yet announced), to the extent of about 192,000*l.*, or about one-third of 1 per cent. per annum on the capital. But the diminished revenue has had further to provide interest, in the form of preferential charges, amounting to a little over 340,000*l.*, or nearly twice as much as the decrease. The decrease, however, has not been evenly distributed. It has occurred on six lines, namely, the Caledonian, Great Western, Lancashire and Yorkshire, London and North-Western, Manchester and Sheffield, and North-Eastern. On these lines collectively the diminution of gross revenue during the half-year has been 491,417*l.*, that on the North-Eastern alone amounting to 185,000*l.* The added charges on these lines amount to 197,000*l.*, making a total decline of 696,000*l.*, which is more than 5 per cent. on the capital for the half-year. That a reduction of only from ¼ to ¼ per cent. in the dividends of four out of these six lines should yet have been effected, and that without diminution of the balance carried over, is a very remarkable as well as a gratifying fact.

It is clear that a great reduction in the working expenses has been generally effected. The directors have also generally taken credit to themselves for having spent less on capital account during the half-year than was authorised and expected. This, no doubt, is a feature for congratulation; but it is one of which the benefit will be felt in the July dividends, not in those for the last expired year.

There is, however, one remarkable feature in the case which demands serious attention. The damage apparently done to the net profits of the companies by the diminution of revenue is considerably less, and the advantage gained by the augmentation of revenue is also considerably less, than the difference in the gross receipts. The question that suggests itself is,—how far have some of these companies gained by the handing over of unprofitable traffic to their neighbours?

A few figures will show that this question is not an idle one. We premise that they are approximate, to this extent, that as we take our information from the Government returns, we speak of half the income and expenditure of 1877, which may not be the exact equivalent of the income and expenditure of the last half of 1877. We mention this, not that it will make any very great difference, but to avoid any charge of want of precision.

We take the four English companies which have paid reduced dividends. These are the Great Western, the London and North-Western, and the North-Eastern, which have paid each ¼ per cent. less; and the Lancashire and Yorkshire, which has paid ¼ per cent. less, according to the table given by the *Standard*. The ordinary capital of these four companies amounts to very nearly 80,000,000*l.*, and the diminution of dividend is thus equal to about 117,600*l.* But the extra dividend paid on preference stock has been 143,700*l.* So that these companies have really divided 26,100*l.* more among their shareholders than they did in the spring of 1878.

The aggregate decline in gross revenue for the half-year on these four lines has been 336,500*l.*, which, at the rate of working cost that ruled in 1877, would give a net deduction, or decrease in net earning, of 155,500*l.* To pay 26,100*l.* more, while earning 155,000*l.* less, requires a very large economy in the working expenses of the last half-year; and however it was distributed, such an economy must have been in some way effected.

Now, if we turn to the three companies of which the increased earnings must, at all events to some extent, represent traffic diverted from their rivals, we find that the Great Northern, the Midland, and the Great Eastern, have received a gross revenue larger by 96,100*l.* than in the corresponding half-year of 1877. This may be set down, if it were a traffic of the ordinary kind, at a net gain of 44,200*l.* A reduction at the rate of two and a half per cent. on the aggregate working expenses of the three lines for the half-year amounts to 84,000*l.* The sum of the two amounts is 128,200*l.* to the good. Extra preference charges come to 98,000*l.*, leaving 30,200*l.* to the good. This sum, if divided according to the increasing traffic, would be nearly equally shared between the three companies. But the only extra payment made to the shareholders is one at the rate of a half per cent. per annum on the Great Eastern; the ordinary stock of which is 10,365,000*l.*, and will, therefore, absorb 28,400*l.* out of the disposable sum.

But as the Great Eastern has earned only one-third of this additional income, while it has derived nearly all the advantages that would ensue from this addition if all the lines were regarded as one concern, it seems tolerably certain that very much of the 65,000*l.* which the Great Northern and Midland have diverted from the London and North-Western and Great Western lines (which have lost together in the half-year 112,000*l.* of gross revenue) must have been traffic which either line would have been better without. This, of course, points to the cost of the conveyance of the mineral traffic.

At all events, it appears from these figures, either that there is a certain amount of non-remunerative traffic (when interest on capital is added to working charges) for which these lines contend; or that there is a considerable difference in the degree to which an increased economy of working charges has been effected on the respective lines.

This becomes still more evident if we look at the case of the North-Eastern. That line has lost 185,354*l.* of gross traffic in the half-year, which, at its rate of working expenses for 1877, is equal to a net loss of 85,000*l.* To this has to be added 32,500*l.* of additional charges, making 117,800*l.* to the bad. But we only find a reduction of ¼ per cent. per annum made on the ordinary capital of 19,610,000*l.*, or about 24,500*l.* for the half-year. The company, therefore, have economised no less than 93,000*l.*, which is more than 5¼ per cent. on their working cost, as compared with 1877. Is it most

likely that this company should have effected more than twice as much reduction in the proportionate expenditure as the other three, or that the ninety odd thousand of revenue that they did not earn from mineral traffic during the past half-year represented a class of business which they were better without?

It is not as if these were solitary questions. It is indisputably shown by the Government returns that the proportionate running charges of the great trunk lines, including maintenance of way, locomotive power, and repairs, increase in a ratio corresponding to, but greater than, other increased proportion of mineral traffic. This might be naturally anticipated as regards maintenance, because the mineral trains are three or four times as heavy as the passenger trains; and, as was lately cited in our columns from the authority of Mr. Stephenson, the wear and tear incurred per mineral train-mile must thus be from three to four times as much as that per passenger train mile. But the Government returns show that there is a pretty nearly corresponding increase in the three items. Bearing this in mind, we again call the attention of those of our readers who are interested in the welfare of our railways to the lessons which are to be derived from the working of the last half-year.

THE CLERGY AND TRADE UNIONS.

THE first of a series of three conferences, promoted by a committee of clergy, in reference to trade-unions, was held on the 1st inst. in the Chapter-house, St. Paul's Churchyard, the Rev. Canon Oakley in the chair. The question for discussion was, "How far is over-production a cause of the present commercial depression?"

Mr. T. Brassey, M.P., read a paper, in which he asked the clergy to recognise the trade-unions, and, if brought into contact with their leaders, to regard them, not as conspirators against society, but rather as men weighted with heavy responsibilities which had been cast upon them by the force of circumstances. Trade-unions were the natural outcome of the present extended development of industry, and their existence must be dealt with as an accomplished fact. If wages must rise with prospering and fall with languishing trade, trade-unions could not exercise any paramount influence in determining the rate of wages. Their committees might do good service by collecting information as to the state of trade and the cost of production in foreign countries, and by watching legislation. It was desirable that working men should look to Parliament for the redress of their grievances, and it was gratifying that they had been encouraged by the sympathy of the House of Commons to seek relief through legislation rather than revolution. In their opposition to piecework, in restraining emulation, in giving no encouragement to diligence and skill, trade-unions were wholly in the wrong. As an advocate of liberal wages for an equivalent in work faithfully and diligently wrought, he was convinced that the future of British industry depended upon our workmen being allowed to give full scope to their natural energies. If their vigour were repressed, our commerce would yield to German and Anglo-Saxon energy in the West. The subjugation of the individual to the arbitrary authority of a guild or corporate body was a cherished fallacy of the workmen of all countries; but the freedom of labour was absolute and inalienable, as was asserted in Turgot's preamble to the edict of 1776, by which Louis XVI. suppressed guilds and monopolies, and repeated in the report of the recent French Commission on the condition of the working classes. In these matters there was wanted more light, a higher education, and a clearer and fuller knowledge of all the facts; and the clergy, if they made themselves masters of the subject, could proclaim the truth from the independent standpoint it was their privilege to occupy. Conflicts between employers and labourers were inevitable, and, as Mr. Mill said, their relations were nearly as unsatisfactory to the payer of wages as to the receiver, both in trade and in domestic establishments. In the latter case an effective means of diminishing the evil was to live simply and unostentatiously. A feeling of interest in work was an essential condition in efficient and economical organisation. Under the form of piecework this principle had been introduced by every successful employer of labour. It was adopted in all cases by his father, and on no other system would it have been practical for an individual sitting in an office in London to undertake large contracts in every quarter of the globe, and to realise that the cost of labour was approximately the same in all countries. As Mr. Siemens had urged, both parties would be materially benefited by so arranging wages as to make them depend in great measure upon the quality and quantity of the work produced. The objection that piecework led to competition was an anachronism in an age of competitive examinations. Co-operative distribution was an undoubted success, but in production co-operation had worked most satisfactorily when only the industrial or practical part of the work had been handed over to the workman, the capitalist retaining the general control in his own hands. The principle had been so applied in the slate quarries of North Wales. The clergy could inculcate the principle of justice embodied in the maxim, "A fair day's wage for a fair day's work." They could teach the vanity of riches, which only the few could learn by experience; they could warn against the perversion of emulation into envy and jealousy; they could enjoin the self-denial and thrift by which provision could be made in good times against inevitable reaction; and they could advance education as the surest means of restoring social harmony, technical perfection, and material prosperity to the trade and industry of the country.

Mr. George Potter read a paper, the object of which was to show that the working men who had urged the limitation of production, and whose advice had been rejected with scorn, had been vindicated by the fact that their remedy had been at last adopted under the pressure of necessity. If the employers had any other remedy to suggest, they ought to make it known. He asked opponents to explain why foreign manufacturers should be beating us in neutral markets when they could not do so in their own markets without protection.

Mr. E. J. Watherston said it was evident that buyers must benefit from over-production, and that manufacturers suffered, as all men must do who made miscalculations. But the evil was temporary, and would rectify itself.

Mr. Mundella, M.P., said we were threatened less by low-priced than by skilled labour and the education and intelligence which adapted products to the wants of customers, which our manufacturers sometimes refused to do until they were losing trade. He wished the Foreign Office would translate and publish the report of the French Commission, which was one long moan about English competition.

Mr. Broadhurst denied that trade-unions did the things suggested by Mr. Brassey, and contended that extra production could not be the panacea for the present depression.

THE NEW FRONTAGE BUILDINGS OF THE LONDON AND SOUTH-WESTERN STATION, WATERLOO-ROAD.

THE scaffolding has been removed from the new frontage of the South-Western Railway Company's station in the Waterloo-road, fully exposing to view the architectural and other features of the structure, which is 160 ft. long, making the entire length of the Waterloo-road frontage of the company's station, from north to south, upwards of 300 ft., and including two broad carriageways on an incline, from the Waterloo thoroughfare to the level of the railway platforms, in addition to another approach to the station by a flight of steps 10 ft. in width, from the ground portion of the new structure now nearly completed. The ground-floor of this addition to the station buildings consists of an arcade or carriageway, 30 ft. in width, in addition to a footway 10 ft. wide, and is about 25 ft. in height to the underside of the floor of the range of offices, waiting-rooms, and refreshment-rooms immediately above. This block of buildings rests upon massive iron girders running longitudinally the whole length of the structure, intersected by cross girders, and resting on two ranges of ornamental coupled iron columns, and on the west side on the walls of the building, one range of the iron columns running along the Waterloo-road frontage, and the other parallel with it, along the centre of the carriageway, which is enclosed from the Waterloo thoroughfare by a low brick wall, with stone coping, surmounted by an ornamental iron railing. The carriageway will be closed at stated periods by ornamental iron gates, both at the north and south ends. The Waterloo-road elevation of the block of buildings above the carriageway is faced with Portland cement, and has a range of seventeen windows, with moulded columns and capitals, and is surmounted by a bold overhanging cornice. At the south side the building is carried on arches westward to a depth of upwards of 1,000 ft., forming the several new lines of rails and the platforms above.

It may be incidentally stated that the extended station is now said to be the largest in the metropolis, occupying an area of upwards of eighteen acres, and stretching in a westerly direction almost to Westminster Bridge-road. Its enlargement has been rendered absolutely necessary by the enormous suburban traffic in almost every direction south and west, in addition to the traffic on the main lines. Upwards of 1,000 houses have been demolished, and several streets absorbed, in order to carry out the works.

THE NEW BOW-STREET POLICE COURT BUILDINGS.

THE works at the intended new Police Courts and Station in Bow-street were commenced on Monday last, the 3rd instant, when the excavations for the foundations were proceeded with, this preliminary portion of the work having been undertaken by Mr. H. Covington, of Pimlico, to whom it has been sublet by Messrs. George Smith & Co., who are the general contractors for the building. The structure will cover a ground area of 21,000 superficial feet, or nearly half an acre in extent, the site having been acquired by the Government by the purchase of several houses and places of business at a heavy outlay. The excavations will involve the removal of several thousand yards of earth, the basement floor being intended to be upwards of 20 ft. below the street level, and formed of a deep bed of concrete.

The building will have a frontage to Bow-street 170 ft. in length, immediately opposite to Covent-garden Theatre, with a bold architectural elevation in Portland stone. Under one roof it will contain both the police station, including the general offices, spacious and convenient accommodation for upwards of 100 officers of the force, with prisoners' cells; and also two police courts for the transaction of public business, attached to which will be two magistrates' retiring-rooms, a magistrates' consultation-room, a law library, together with the magistrates' clerks' and other general offices. The principal court, on the ground-floor of the building, will be 40 ft. in length and 30 ft. in width, with a height of 26 ft. to the ceiling, above which, in the centre, there will be a lantern, for light and ventilation purposes, 19 ft. in height. In addition to two large entrances to the court for ingress and egress, for the general public, there will also be separate and independent entrances for witnesses, solicitors, and reporters respectively. The second court will be on the first floor, and is intended to be called the Extradition Court, where cases of that character, amongst others, will be heard. Attached to the spacious apartments for the officers of the force there will be a mess-room, and likewise a library and recreation-room on the first floor. The principal street-entrance to the building will be at an angular elevation at the corner of Bow-street and Broad-court, whilst the prisoners' van-entrance will be about the centre of the Bow-street frontage, leading into a court-yard. The estimated cost of the building, including the property and land which have had to be purchased by the Government, is set down at 120,000*l*. It is expected that the building will be completed and ready for occupation in about eighteen months.

The designs and plans have been prepared by the architects of her Majesty's Office of Works, and the erection of the building will be under the personal superintendence of Mr. John Taylor, who is connected with the architectural department of this branch of the service.

Secretaryship, Society of Arts.—We are glad to see that the Council of the Society of Arts, at their meeting on Monday, appointed Mr. H. Trueman Wood secretary, in the place of the late Mr. P. Le Neve Foster. Mr. Trueman Wood had for some time past acted as assistant-secretary, and has been for some years editor of the Society's *Journal*.

A FREE LIBRARY, MUSEUM, AND GALLERY OF ART BUILDINGS AT PRESTON.

THE town of Preston is likely to possess, very shortly, a block of buildings on a very comprehensive scale, containing a free library, a museum, and a gallery of art, the cost of which is estimated at 70,000*l.*, exclusive of land, which will be defrayed with the funds arising out of a munificent bequest which was recently made by Mr. Harris, a gentleman well known in the town, who left a large sum at the disposal of trustees for the establishment of such an institution, and other educational agencies.

This bequest has led to the Free Library Committee of the corporation appointing a sub-committee of their body to inspect and make a report as to the erection of the proposed new building. The sub-committee have just made a long and elaborate report, in which they state that they have visited many of the chief public libraries, museums, and art-galleries in the kingdom, and have obtained information respecting the structure and arrangements of others. They add that they have also made themselves acquainted with the principal features of the most noted libraries and museums abroad. The committee, in continuation, recommend a comprehensive permanent foundation for the encouragement of learning, the cultivation of the arts and sciences, and the free diffusion of a varied literature, for the benefit and advancement of all classes in Preston and its immediate neighbourhood. As regards the land to form the site of the proposed buildings, the committee suggest that a site in the market-place, consisting of 3,800 square yards, or upwards of three-quarters of an acre in extent, and belonging to the corporation, should be offered by them to the Harris trustees, and they estimate the value of this land at 25,000*l.* On the Harris trustees obtaining the land, the committee propose that they should erect upon it a structure at a cost of 2,500*l.*, to consist of lending and reference libraries, reading and news rooms, museum, and art-galleries. The committee further propose that the Harris trustees should expend 5,000*l.* in books for the Harris reference library, consisting chiefly of the works of modern and living authors, and comprising some 15,000 volumes, and these, with what is known as Dr. Shepherd's Library, now under the control of the corporation, would make 25,000 volumes to commence with. The committee likewise propose that the Harris trustees should expend a further sum of 5,000*l.* in purchasing examples of the fine and industrial arts, and objects of scientific pursuit, and finally that the trustees should place the sum of 10,000*l.* with the corporation, on interest at 4 per cent., to be annually expended by the corporation in adding to the reference library, museum, and art galleries; the corporation also to provide books, periodicals, and newspapers, and to take care of the building in perpetuity, and the collections contained it. The committee likewise suggest that the institution should be in connexion with the establishment at South Kensington, like those at Nottingham and other towns. The project will involve the expenditure of 70,000*l.* at the disposal of the Harris trustees.

This important and comprehensive proposal and its details are now under the consideration of the corporation and the Harris trustees respectively, and there seems every probability that in its main features it will be adopted and carried out.

Water from the Lower Green Sand.—It is reported that the Lower Green sand at Caterham has just been reached at the depth of 851 ft. from the surface, and an abundant supply of pure water is now flowing therefrom and will shortly be used in the district supplied by the Caterham Spring Water Company. The boring operations were commenced on the 29th of July last with a boring of 18 in. diameter, and the Lower Green sand was reached with a diameter of 15 in., solid cores of the strata passed through having been obtained. Other borings are being put down by the New River Company at Turnford and Ware, to prove the Lower Green sand at those places; while the Lambeth Water Company is putting down a bore-hole at Ritton to test the depth of the chalk-basin at that place. The boring at Caterham has been carried out by the Diamond Rock-boring Company.

PNEUMATIC SEWERAGE.

MANCHESTER ARCHITECTURAL ASSOCIATION.

A PAPER was read on the 25th ultimo by Mr. Charles Tuke upon the subject of pneumatic sewerage. It was illustrated with plans and details of the two systems invented by Capt. Liernur and Mr. Isaac Shone, C.E., respectively.

Mr. Tuke explained his subject practically by means of plans of the new watering-place, St. Anne's-on-the-Sea, which he showed laid out upon the two systems. There was no very serious engineering difficulty in sewering the inland half of the town so that the sewage might be taken from the beach, but there was a considerable difficulty in draining the seaward side inland, except by means of a deep sewer at a very slight gradient, assisted at the outfall by pumping machinery. The writer then entered into a description of the Liernur system, which has been described before now in our pages. He considered the weak link in the chain was the method of treating the slop-water, which was, in fact, turned into a separate system of sewers in its crude state, minus the gross particles in suspension, which were intercepted by a fine screen.

Mr. Shone's scheme was then entered upon. Mr. Tuke pointed out that this system did not claim to deal with the sewage at the outfall further than to aid, by means of pneumatic power, in its distribution upon the land or into the sea, or into tidal rivers at all and any state of the tides, neither did the system interfere in any degree with the ordinary domestic sanitary arrangements, except that it urged in unison with all advanced sanitary authorities,—as complete as possible disconnexion of dwelling-houses from the sewage-gas inlets, in the form of the soil and waste-pipes and cellar-drains. It was recommended that a separate system of drains should be provided for the surface-water, so as to reduce the steam-power needful to work the "ejectors"; but even this restriction was not a *sine qua non* of its adoption.

In the plan of St. Anne's, laid out under this system, the town was shown laid out into five groups or areas, each drained to its centre with ordinary glazed earthenware gravitating pipes, laid to a minimum fall of 1 in 200. In each of these centres was placed a "Shone's pneumatic liquid ejector," served with compressed air, by means of small iron underground pipes, communicating with an automatic air-compression and steam engine, situate near the gasworks. The ejectors were shown placed in underground chambers, having access to the street by manholes. From each of the two ejectors at the intersection of the Drive and St. Anne's-road and a parallel road at the Blackpool end of the town, the main sealed sewers, of cast iron, run up-hill, until the high ridge at the railway was crossed, after which they discharged into glazed earthenware gravitating pipes, with rapid gradients, and consequently reduced sectional areas, by which the sewage was conveyed on to the moss. The other three ejectors discharged their contents directly into the upper part of this pot sewer at such a level as given to gain additional head to the fluid.

The statements made as to relative costs were vague.

GLASGOW INSTITUTE OF ARCHITECTS.

A MEETING of this Institute was held on the 27th of February, Mr. Campbell Douglas, the president, in the chair. The secretary read the correspondence which had taken place between the Council of the Institute and the Town Council of Greenock regarding the terms of the proposed competition for the new Municipal Buildings.

The President said that while it was to be regretted that the Greenock authorities had disregarded their remonstrances, and refused to alter the stipulation limiting the rate of remuneration to 4 per cent., he did not think that the action taken by the Institute laid any obligation upon its individual members to refrain from engaging in the competition. They by no means advocated uniformity of payment irrespective of circumstances.

Mr. Honeyman adverted to the prejudicial tendency of inadequate remuneration in the way of undermining the independence and integrity of the profession. An architect, more, probably than any other professional man, should be above suspicion, and an underpaid architect is exposed to strong temptation to indulge in sins, both of omission and commission. This was the aspect of the matter which really most interested them. They were jealous of their professional honour. But the ratepayers of Greenock should understand the probable result to them of their Town Council's short-sighted and most mistaken attempt at economy. There were plenty of architects who would be very dear architects for their employers, although they should receive only half of the proposed fees. No one who understood such matters could doubt that if these unsatisfactory conditions resulted in the work being entrusted to an inexperienced architect, or an architect who had made up his mind to be well paid for his labour indirectly, if not directly, there was no saying to what extent needless expenditure might be carried. The proposed paltry saving would be but as a drop in the bucket. He sincerely hoped that the people of Greenock would learn this by bitter experience, so that their mistake might be manifest, and their conduct hereafter might be referred to as a caution, not as a precedent. He thought that the course followed by the Glasgow Institute in sending an independent remonstrance to the Greenock authorities was, upon the whole, preferable to that proposed by the Liverpool Society. We have no idea, he said, of insisting upon every member of the profession being paid at the same rate, and the combined protest suggested by the Liverpool Society might have been misunderstood by the public as a demonstration in favour of such a demand. He had no doubt that the Royal Institute had taken this view of the matter, and had, therefore, declined to co-operate in the way proposed.

Mr. James Thomson thought that if the promoters of a competition were alive to their own interests they would make it the means of securing the services of the best man, irrespective of the question of fees altogether.

ASSOCIATION OF SANITARY INSPECTORS.

A MEETING of the recently-formed Association of Sanitary Inspectors has been held at the Hare and Hounds Hotel, New Elvet, Durham. There were present Mr. J. W. Spoor (chairman), Mr. William Ground, Lanchester; Mr. Barras, Chester-le-street; Mr. Hindmarch, South Shields; Mr. Croad, Darlington; Mr. W. C. Blackett, Durham; Mr. James Raine (hon. sec.), &c. The Association was formed a short time ago to advance the principles of sanitary reform throughout the country, which it is proposed to do by the reading and discussion of papers on sanitary subjects, visiting and inspecting localities where sanitary works are in progress, and by mutual assistance in applying the laws upon the subject, and generally to diffuse information and advance the sanitary condition of the country.

The Chairman announced that several gentlemen throughout the country had expressed their approval of the scheme, and had promised their assistance and co-operation in carrying it out. The membership at present was limited to about thirty; but any public officer engaged under a sanitary board, either urban or rural, was eligible for admission, so that a large addition of members was anticipated.

A discussion ensued on the provisions of the Public Health Act and the Contagious Diseases Act, as a means of checking and preventing disease.

Mr. Blackett drew the attention of the meeting to the great need of sanitary reform in the construction of farm-buildings. An immense amount of sewage, which ought to be collected in tanks and utilised in fertilising the land, was now running to waste, and endangering the health of the community by polluting springs and streams. Not only did this waste tend to diffuse the spread of disease, but it also impoverished the land, and rendered the farmer less able to pay his rent, or compete with other countries. All fold-yards, ashpits, &c., ought to be covered in and kept dry.

Mr. Ground drew the attention of the meeting to the new Order in Council recently issued by the Government for licensing and registering cow-keepers. He thought the time was not far distant when sanitary officers would be entrusted with the supervision of cow-byres, to see that they were properly lighted, drained, and cleansed, with a view to the prevention of disease amongst cattle.

It was suggested that the members should visit the sewage-farm at Darlington, or the drainage works now being carried out at Chester-

le-street; but, after some discussion, it was decided that the next quarterly meeting should be held at Durham, on the 6th of June.

THE GREAT PYRAMID.

Mr. R. A. Proctor, F.R.A.S., has delivered a lecture in the Royal Institution, Manchester, on "The Great Pyramid." The lecturer said it would be in the knowledge of some that he had brought forward a theory which was intended to account, and he thought did account, for the principal characteristics of the Great Pyramid, and of the series of pyramids of which it was the chief member. The theory generally adopted was that the pyramids were built solely for the purpose of containing the bodies of the kings of Egypt. Another theory which had occupied a great deal of attention was that the pyramid was intended to symbolise certain forms of knowledge which were divinely communicated to the architect and the builders; in fact, that it was a sort of stone Bible. In this view, the Great Pyramid contained wonderful information about the past, and wonderful information or prophecy as to the future, for it told us, if the pyramid was to be regarded as a true prophet, that the year 1881,—the year when Mother Shipton said the end of the world was to take place,—was the date of the second coming. The theory he had to advance as reasonable was, that while the pyramids were erected with the object of advancing astronomical observation in some way, it was not for the interest of science. He could not but think that astrology was at the root of all the work; that they thought that by erecting those buildings, placed opposite the cardinal points of the compass, and making observations from them at stated times, with particular ceremonies, and with the help of the priesthood, who were the astrologers of those days, they would be able, by studying the stars, to learn the future of the kings, learn the times when they could carry on their campaigns against their enemies or other operations with advantage, and study the motions of comets and all strange appearances in the heavens, and so ascertain how the interests of the kings could be best advanced. He described the peculiarities of the interior construction of the Great Pyramid, and criticised the different theories advanced in regard to the structure. In conclusion, he said that if we considered the pyramid aright, instead of looking at it with admiration,—although we could not but admire it as a great work,—it seemed to him it was one of the most painful records of selfishness, tyrannical abuse of power, of forgetfulness of the interests of hundreds and thousands of men, in order to advance the interests of one man possessed for the time being of power.

THE MATHEMATICAL THEORY OF THE GREAT PYRAMID.

Sir,—In your issue of June 16th, 1877, you did me the honour to insert a letter of mine containing a statement of the principal results which I have deduced in reference to this interesting subject.

I have now arrived at what I think a very remarkable conclusion; and, as it may be of general interest, I hope you will not deem this communication unworthy of a place in your valuable and widely-circulated journal.

I find by a comparison of numbers that the Egyptian mathematicians evidently arrived at the same results as Archimedes did, long after them, in regard to the ratio of the circumference of a circle to its diameter.

In the letter above alluded to, I omitted to state (for it was known to me at that time) that the circle circumscribing the original base of the Great Pyramid would be approximatively equal to the *sum of the vertical height and the four corner heights* (corresponding to a ratio of 3·14064...); but it did not occur to me till recently to try and see if any connexion existed between the Pyramid numbers and the results obtained by Archimedes. This I have now done, and the results may be exhibited as follows:—

Each side of the base of the pyramid being equal to 440, and the height being 280 great cubits ($=\frac{7}{11}$ of a side of base).

The diagonal of the base = 622·2539... cubits.

The sum of the vertical height and the four corner heights = 1954·2756... cubits.

The circumference of the circle was found by Archimedes to lie between $3\frac{1}{7}^0$ and $3\frac{10}{71}$ of the diameter, the mean of these values being $=\frac{15615}{4970}$.

Multiplying the pyramid numbers by 8, we have,—

$$\frac{8\times 1954{\cdot}2756}{8\times 622{\cdot}2539} = \frac{15634{\cdot}2048}{4978{\cdot}0312} \quad (=3{\cdot}14064\ldots).$$

A result very near the Archimedean mean, differing (omitting the decimals) by an increase of 19 in the numerator, and 8 in the denominator; the Egyptian mathematicians doubtless *inferring* that the mean fraction would express too great a ratio, and they therefore varied it so as to obtain a result less than the mean, which would be equal to a ratio of 3·141644.... By experimenting with a large arc, such, for instance, as 45°, they would soon find that the arc itself is *less* than the mean between the sine and tangent; this, I suspect, they did, and made an allowance accordingly. I am inclined to think, however, that the ratio actually inferred, was that of 977 to 311 (=3·141480...), which numbers are exactly half the pyramid values, if the decimals be omitted—$\frac{1}{2}$ 1954 = 977, $\frac{1}{2}$ 622 = 311, and their difference = 666 (curiously coinciding with the number of the beast).

The number 666 may certainly be connected with the pyramid, for $400+\frac{666}{36}=418\frac{1}{2}$ great cubits, which is the height from the corners of the base to the vertex, correct as far as the figures go.

The Hindoo ratio, 3,927 to 1,250, for the circumference, can be similarly identified with the Archimedian results, for multiplying by 4 we obtain $\frac{4\times 3927}{4\times 1250}=\frac{15708}{5000}=\frac{15615+93}{4970+30}=3{\cdot}1416$, showing that the Hindoos also independently arrived at the same results as Archimedes.

Thus we find that the celebrated Greek mathematician was anticipated by the Egyptians by at least some eighteen centuries, and probably by the Hindoos as well. As it is most likely that all the pyramids were intended to be of the same proportion as the great one, the question naturally arises, Why should the Egyptian monarchs choose such a design for their tombs? The only reply which suggests itself to me is, that the circle being an emblem of eternity, the pyramids, from their magnitude, were intended to stand for all time; and, if this was the idea of the builders, it cannot yet be said that they have failed of their object.

W. Hayden.

P.S.—As previously stated, the cubits were in the proportions of 22, 25, and 30 digits, and of the respective lengths of 18·216, 20·7, and 24·84 inches.

OBITUARY.

Mr. E. Leader Williams, C.E., died at his residence, Worcester, on the 26th ult., aged 75. His name is identified with the improvement of the River Severn, of the works connected with which he was resident engineer.

The late Mr. C. J. Adams, some time honorary secretary of the Architectural Association, whose death was announced at the last meeting of that body and of the Institute, had been for some fifteen years settled at Stockton-on-Tees, and carried out several public and private works in that neighbourhood. Amongst them may be mentioned the Royal Exchange Buildings, Middlesbrough, and the Darlington Workhouse,—both gained in competition; Grammar School, Coatham, Redcar; British Schools, Ragged Schools, and Primitive Methodist Chapel, at Stockton; flour-mills, oil-mills, and additions to brewery, South Stockton; and residences at Stockton. Latterly he was principally engaged in the manufacture of cement, plaster, and their products. He had been for three years a member of the Town Council, and held a good position both socially and as a man of business.

Drawings in Brittany.—At Mr. Rogers's establishment, 29, Maddox-street, Miss Eliza Turck exhibits nearly forty drawings in water-colours, made in Brittany, and showing many of the most interesting objects and sites to be found in that country. Having been mostly finished on the spot, they show some inequality of merit, but all are entitled to commendation for conscientious, honest work, and we were glad to find that about a fourth of them were already sold.

"ART FOR ART."

Sir,—May I say a few words in reference to Mr. Caine's recent lecture at Liverpool on Rossetti's poems, and the letter in your columns, signed "Art for Good," which somewhat violently attacked the lecturer? Evidently the writer agrees with Mr. Rathbone, the chairman on the occasion of the lecture, who, at its close, did his best to undo the effect of the whole address, and delivered himself of those flowing and glowing moral sentiments which I find at the end of your report of the lecture. Mr. Rathbone and "Art for Good" are in perfect accordance: they equally and entirely misunderstand Mr. Caine, and the whole purpose of his paper.

But the real truth of the matter is very simple. What the lecturer chiefly insisted upon (and this is the point which has given such offence to the imagination of "Art for Good") was, that no great art,—indeed, no true art,—is ever self-conscious, or pursued with a direct moral aim. "Art for Good" talks much about this assertion of the lecturer. But the statement is undoubtedly true, and no one who has studied art with any insight can help seeing it. Just in proportion as the work becomes self-conscious and is pursued with a direct didactic aim, it fails in something of its inspiration, and is, by so much the less, perfect art. Shakspeare, if the views of Mr. Rathbone and "Art for Good" be correct, was the most immoral of all writers. Are they prepared to maintain this?

To descend from Shakspeare's to our own time, how much of the genius of Tennyson has been squandered through the over-didactic nature of a considerable portion of his work? And so most notably with Wordsworth. And a most notable example of the very opposite,—an example of what, in fact, I should call a perfectly moral artist,—perfectly moral, because given up with complete and passionate abandonment "to his mood,"—is to be found in Keats. Mr. Caine would probably agree with me.

There are three aspects of the divine, it seems to me,—truth, beauty, and goodness. The second person of this divine trinity will ever be the deity worshipped by all who have any part or claim in the sunlit land of art. Beauty shines upon them; and they do not inquire further, but are passionately exultant or calmly content. It is one of the first duties of an artist not to be over-anxious as to the moral bearing or ethical nature of any of his subjects of song. If it but be beautiful, to him, at all events, it is right.

And then there remains, of course, the balancing and correcting fact to which Mr. Caine alludes: that an artist of noble nature cannot be immoral, because his nature will ever "permeate" his works, and an unconscious purity will ever be there. To aim consciously at inculcating moral tenets in verse is to descend from the level of a poet to that of a mere hymn-writer. The moral teaching should be there, but it should teach as the sun teaches, as the stars, as the sea, as the pure white rose; indirectly, and without the clamorous intrusion of ethical common-place.

In the meantime, the philosophers and the men of science will ever pursue Truth, and the preachers, Goodness; and this is both their right and their duty.

One word with regard to the extraordinary utterances of Mr. Rathbone from the chair, as reported in your columns. Rossetti, he says, depicts in his poems, "The love of man for woman, not the love of man for man." By this latter expression Mr. Rathbone means, I suppose, "The love of man for humanity, for the race." Well, it is not true that Rossetti never yearns over the race, never sings it, though it is certainly true that his singing is not, as a rule, political or national. But what of Mr. Swinburne, whom Mr. Rathbone would probably condemn even more vehemently than he condemns Rossetti? No poet (*vide* "Songs before Sunrise," for only one example) has ever sung of humanity with more exalted passion.

And as to "the love of man for woman" being in itself a less noble thing than the love of man for the human race, I can only say that if Mr. Rathbone is prepared to take up the dying embers of this old theological dream of the impurity or unnobility of simple love and passion as such, I am prepared, in love's name and in art's name, to meet him with the fearless counter-statement that "the love of man for woman" is at the root, and is the crown, of all nobleness, and purity, and beauty whatsoever, and is the very basis of all religion, and the

eternal recompenser thereof; being here, in the midst of suffering, and sorrow, and death, the one painless unsorrowful death-defying immutable thing.

"For me the wonder ceases not, but increases;
A stern belief I'm holding as mine own,
That only in the bad, in broken pieces,
Has *love of man and woman* yet been known:
That time it is, when earthly passion ceases,
To hurl the planet from its central throne."

GEORGE BARLOW.

THE CITY OF LONDON SCHOOL COMPETITION.

SIR,—You deserve the thanks of all architects for your well-timed remarks as to this competition. Such requirements in an open competition of the sort are really monstrous. But what are we to do? No architect of eminence will set the example of publicly declining to compete. Several eminent architects will be sure to send all the things asked for or suggested, and a lot more besides. I will do some of them the credit of saying that they will grind their teeth occasionally, and think themselves ill-used; and regret that devising new methods of swamping other competitors affords them no lasting consolation. Many a one will, as a matter of course, act as though he thought the cleverest way of cutting some one else's throat was to begin by cutting his own. The Institute is powerless; even the Association seems to find the task of dealing with competitors too heavy. A profession with leaders such as we have,—with so little confidence in the good intentions of anybody,—must, I fear, go on from bad to worse, meriting more and more the contempt of the world.

If there was any one among us with influence, leisure, and good will enough to bring about a radical change of temper and conduct about competitions, he might earn for himself enviable fame, and the real gratitude of the members of his own profession. A.

PRESTBURY CHURCH, MACCLESFIELD.

SIR,—Being intimately acquainted with this church, and having several friends among the gentlemen who are endeavouring to promote its reparation, I am in a position to know what is proposed to be done, and am able to contradict the untrue statements and false assumptions of the correspondent who has addressed you in opposition to the contemplated works.

The desirability of some of the proposed alterations which your correspondent denounces, is open to difference of opinion. These I shall not go into. My objection is to the mis-statement of facts and the hazarding of wild conjectures.

The removal of the gallery does not involve the removal of the screen in the tower-arch. This screen, including the upper portion or second screen, will be retained *in situ*, together with the interesting pews of the seventeenth century, which abut on it on the church-side.

The stone floor, of lozenge-shaped quarries, is not "condemned," but is to be jealously retained and to be imitated for such parts of the floor as have to be repaved.

The idea of alteration to the piers of the arcades is wholly alien to the thoughts of the custodians of the building, and your correspondent must have ransacked his brains for matters of objection when he conceived so strange a notion as this.

The candle-brackets, which have an interesting history, are especially cared for, and will not even be removed from their places in carrying out the repairs.

The plinth of the modern aisle is intended to be altered, in connexion with the new buttresses. The term "Geometric," as applied to the tracery of the windows is a *lapsus pennæ* of the writer of the pamphlet.

The battlements of the tower are to be rebuilt because they are dangerous, and not renewed, as is gratuitously assumed. Your correspondent, in his old age, must have become very short-sighted, or he would have seen that portions of the intermediate pinnacles remain on all sides of the tower.

The rude external staircases built against the western walls of the aisles are modern, of the date of the gallery, to which they were intended to give access. One of these has been for many years in a ruinous condition, and disused, and with the removal of the gallery neither will be required.

The interesting eighteenth-century chancel-screen is intended to be kept in its present position; the "presumption" of your correspondent is quite out of place.

The "ancientest feature in the whole church, the lancet triplet-window on the north side of the chancel," is not to be removed. The organ-arch will be between it and the chancel-arch.

The chancel will not be new, nor will the brasses and monuments be swept away. The small panels of painted glass in the large eastern window of the modern north aisle will be replaced in another window. The eighteenth-century screens and pews at the end of this aisle are intended to be retained, together with the high wainscoting on the north wall.

On all these matters your correspondent would have been correctly informed if he had but inquired of any of those gentlemen who have had a share in putting forward the scheme which has aroused his opposition.

Such false charges as are here noticed can only be called *wilful misrepresentations*, for nothing short of this they can be when no attempt has been made to ascertain the truth.

VERITAS.

THE MELBOURNE INTERNATIONAL EXHIBITION, 1880.

IN accordance with a Commission issued under the great seal of the Colony of Victoria, and with the co-operation of the Imperial Government, an International Exhibition of Arts, Manufactures, and Agricultural and Industrial Products of all Nations will be opened at Melbourne on the 1st day of October, 1880.

The Exhibition will be held in buildings specially erected for the purpose in Carlton Gardens, centrally situated in the city of Melbourne, and the cost of erecting the buildings, and all expenses incidental to the Exhibition, will be defrayed out of funds voted by the Parliament of Victoria. We gave a view of the design at the close of last year (see vol. xxxvi., p. 1305), and the first stone of the building has just now been laid.

The Commissioners are inviting the British, Foreign, and Colonial Governments to take part in the Exhibition.

Information upon any question of details can be obtained upon application to the Agent-General for Victoria, 8, Victoria Chambers, Westminster.

THE PARKES MUSEUM OF HYGIENE.

SINCE the commencement of the present year the contents of the museum have increased considerably, and it is expected that it will be ready for opening to the public by the end of April. The additions include drawings of the Peabody Dwellings for the Poor, presented by the architect, Mr. H. A. Darbishire, and a number of designs for cottages, villas, &c., by Mr. Norman Shaw, R.A., given by Mr. W. H. Lascelles. The collection of sanitary appliances now includes Messrs. Verity's new ventilators, as fixed in the Reform Club, to work which water is used as a motive power by means of a small jet direct from the fire-main. One of Benham's ventilating globe lights has been fixed up in the museum, with section of joists, floor and ceiling showing every detail of the construction. Specimens of many other means of ventilation are also to be seen, including the several patent contrivances by Messrs. Tonks & Son, of Birmingham. The library now consists of upwards of 400 volumes, exclusive of pamphlets. Pending the opening of the museum to the public, tickets of admission may be had on written application to the curator, Mr. Mark H. Judge, University College, Gower-street.

New Fruit and Flower Market for London.—The Markets Committee of the Court of Common Council have drawn up a report recommending the construction of a new fruit, vegetable, and flower market for the City, at a cost not exceeding 30,000*l*. The City Architect had prepared plans and a model, estimating the cost at 56,000*l*., but the committee thought that a design of less expensive character would meet all the requirements. The site extends from Charterhouse-street to Snow-hill, and from Farringdon-road to the London, Chatham, and Dover line. All the excavations have been made, so that the basement can be at once proceeded with. The report has been adopted by the Court.

BUILDERS' CLERKS' BENEVOLENT INSTITUTION.

THE twelfth Annual General Meeting of this Institution was held at the Offices, 27, Farringdon-street, on February 25, Mr. T. F. Rider, president, in the chair. There were also present Mr. George Plucknett, Mr. Thomas Robinson, Mr. E. Graystone, Mr. E. Brooks, Mr. J. A. Robson, &c.

The Report showed an income for the past year of 297*l*. 17s. 11d., and included some liberal donations from the President, the Builders' Society, Mr. E. S. Rider, Mr. Charles Kynoch, and Mr. Edwin Lawrence.

One additional pensioner, Mrs. Hannah Wade, had been elected, and a second presentation to the Orphan Working School had been purchased, Ethel Mary Jeffreys having been elected to enjoy the benefits afforded by this excellent school. During the year the pensions had been increased to 26*l*. per annum to men, and to 24*l*. to widows, and the Report concluded by expressing the hope that more of the Builders' Clerks would become subscribers.

Mr. Rider, in moving the adoption of the report, after referring to the lamented death of Mr. B. Col's, one of the trustees, and to the severe illness of Mr. T. F. Cook, one of the original promoters of the Institution, said that the year 1878 had certainly been a wretched one. Strikes, war, badness of trade, and other calamities had characterised it, yet amidst it all he was happy to say that the Institution had held its own, and good work had been done. They had elected an additional pensioner, and had purchased another presentation to the Orphan Working School. Looking to the balance-sheet, he observed that while the income of 1877 was 292*l*. 7s. 10d., that for 1878 was 297 17s. 11d., showing a balance in favour of the latter year. Again, an alteration had been made in the rules, by which the pensions had been increased, and he might observe, with regard to the latter point, that the news had been received without any grumbling on the part of the pensioners. He certainly desired to see a greater number of builders' clerks on the list than was the case; and it had occurred to him that if a dinner were held, which he hoped would bring together a good number of clerks, and if they could get gentlemen like Mr. Plucknett, Mr. Robinson, and Mr. Conder, to come and encourage them, he thought it might be a means of benefiting the Institution.

The ordinary business of the meeting was then attended to, and on the motion of Mr. Plucknett, seconded by Mr. Robinson, a vote of thanks was accorded to the Chairman, and the proceedings closed.

COMPENSATION CASE.

TRUSTEES OF STARLING'S CHARITY *v.* METROPOLITAN RAILWAY COMPANY.

MR. UNDER-SHERIFF BURCHELL on Monday presided over a special jury at the Middlesex Sheriffs' Court, in the case of the "Trustees of Sir G. Starling's Charity *v.* The Metropolitan Railway Company," to ascertain the value of some land in the Minories required by the company.

On one side the value of the property was put at 4,100*l*. and upwards, and it was stated that in consequence of the city improvements during the last seven years property in the Minories had increased in va ue 50 per cent.

On the part of the company the value was estimated at 2,600*l*., and the great increase in value was denied. As the notice to treat was given in 1877, it was maintained that the intended widening of Eastcheap should not be taken into consideration.

The jury, who had taken a personal view of the locality, assessed the compensation at 3,655*l*.

IMPORTANT TO CONTRACTORS.

LYSAGHT *v.* PEARSON.

THIS action was brought to recover 240*l*., the price of a corrugated iron roof, made and erected by the plaintiff for the defendant.

The facts of the case were that the defendant entered into negotiations with the plaintiff for the supply of two corrugated iron roofs in January, 1877, and after some correspondence it was agreed that the plaintiff should supply and erect them for 320*l*. The plaintiff supplied and erected the larger of the two roofs required, but refused to supply the second and smaller roof until the price of the larger one had been paid to him. The defendant refused to pay the price of either roof until the whole of the work contracted for had been completed, and gave the plaintiff notice to proceed with the erection of the second roof. On the plaintiff still neglecting to proceed with it, the defendant employed another person to supply and erect it. The plaintiff then brought this action.

The defence set up by the defendant was that, the contract being entire and indivisible, the completion of the whole work was a condition precedent to the plaintiff's right to sue for the whole or any part of the price of it; and he further alleged that the larger roof was deficient and not according to contract, and made a counter-claim for damages for loss of profit occasioned by the delay in completing the second roof.

At the trial, at the Bristol Assizes, before Mr. Justice Stephen, a verdict was taken by consent for the plaintiff for 320*l*., subject to a deduction of the amount of the fair value of the small roof, the expense occasioned by the deficiency (if any) of the large roof, and the damage (if any) occasioned by the delay in completing the small roof, these sums to be ascertained by a reference to arbitration: and the learned Judge decided, as a matter of law, that the plaintiff was entitled to recover the 320*l*., subject to the deductions above mentioned. The defendant appealed from that judgment, and the case came before Lords Justices Brett, Cotton, and Thesiger on the 1st inst.

Their Lordships held that as the contract was entire, the plaintiff would not have been entitled to sue if the defendant had done nothing to alter the position of the plaintiff, for the plaintiff had throughout been in the wrong, and was not ready and willing to perform his part

of the contract. But the defendant had taken the matter into his own hands, and completed the second roof. He had not merely taken possession of the property; if he had only done that, he would not have been liable; but he had completed the second roof, so that it was impossible for the plaintiff to complete it. The plaintiff was, therefore, entitled to sue on a *quantum meruit*, and the judgment of the Court below must be affirmed.

THE LAW AS TO TRADE UNIONS IN SCOTLAND.

AN important judgment was given on the 22nd ult. in the second division of the Court of Session, Edinburgh, affecting the proceedings of employers and *employés*.

It appeared that during a lock-out or strike, a glass-cutter in Glasgow, a member of the Birmingham United Glass Cutters' Association, was mulct in 50*l.* damages in the Glasgow Sheriff Court, on the ground that he was a member of an unlawful combination, and had been guilty of "inducing" or "seducing" workmen to break their contract with Messrs. Cowper & Sons, glass manufacturers, Glasgow, whose old hands were at the time locked out.

On appeal to the Court of Session, the workman has obtained a reversal of the judgment of the inferior court; Lord Ormidale and Lord Gifford deciding in favour of the appellant, on the ground that there was no evidence of his seducing or intimidating, and the Lord Justice Clerk sustaining the Sheriff's decision, his opinion, as he said, being diametrically opposite to that of their lordships. The majority held that just as the masters paid the strangers' expenses to come to Glasgow, it was just as lawful for the workmen to pay their expenses home again, so that prior to this they had not by violence or threats of violence, molestation or obstruction, done anything calculated to force the new men to break their contract, or prevent them enjoying free market for their labour. According to the law of Scotland, an act which it was lawful for one person to do did not become unlawful where one or more persons combined to do it. Messrs. Cowper & Sons were found liable in the expenses of both courts.

RUINOUS HOUSES UNDER THE BUILDING ACT.

AT Marlborough-street, Mr. Napier, on the part of the Metropolitan Board of Works, applied to Mr. Mansfield under the Building Act, 18 and 19 Vic., cap. 122, section 80, for an order for the removal of the inmates of the houses 17, King-street, and 7½, Cross-street, those houses having been certified by Mr. Kerr, the district surveyor, to be in a dangerous state. Orders had been made at that court, but had not been carried out. Although the application was an *ex parte* one under the Act, yet, out of courtesy to Mr. Banister Fletcher, notice had been given to him that an application was to be made so far as regarded 17, King-street. Mr. Kerr gave evidence to the effect that the house was in a most dilapidated state, and might fall at any moment, and also that the order of the Court had not been obeyed. A person asked for an adjournment on behalf of Mr. Fletcher. Mr. Mansfield said that, after what had been stated by the surveyor, he should make an order.

THE SOUTH SHIELDS CORPORATION NEW STABLES.

THE new stables erected by the Corporation of South Shields in Victoria-road were formally opened on the 18th ult. The stables are approached by a large gateway, having on either side houses for the horse-keeper and foreman. They are built upon an eligible site, a large portion of which will be utilised as a stone-yard. Extending nearly the whole length east and west is a covered shed for carts and street-cleaning implements. This shed is 150 ft. long, and provides ample accommodation for the carts and implements. The stables are 90 ft. by 30 ft., and have standing-room for twenty-six horses, and two large boxes. The horses stand back to back, and the heel-posts of the stables are contrived as iron columns, to carry the granary floor above. There is a window which opens over every horse's head, in addition to the ordinary air-passages through the walls, and from the centre of the ceiling, between the two rows of horses, are shafts carried up through the granary to the roof, and terminating outside with Howard's patent revolving foul-air extractors. At the east end of the stables is an engine-room. From the engine belts are carried up to the granary, and these can be adjusted to the machinery for crushing oats and corn, chopping hay, and hoisting horses' food to the granary. A covered lobby-entrance contains the boiling or mash furnace-pots, and there are also a blacksmith's or farrier's shop, with two forges, a large cartwright's shop, with broad folding doors, and a hospital for sick horses. The whole of the buildings are bounded on three sides by a buttressed brick wall, and on the fourth side by another extensive cart-shed, back to back with the one above mentioned, and under the same roof. There are likewise a store-room and office, and a covered shed for the Corporation workmen. The space within the walls is an acre and a half, and paved surfaces are provided for all working purposes. Water and gas are laid on throughout, and hydrants are provided in case of fire.

The buildings were designed by Mr. Matthew Hall, borough surveyor, assisted by Mr. R. Greaves, and Mr. C. Cobham has discharged the duties of clerk of the works.

The contract has been carried out by Messrs. D. Kennedy & Son, of Jarrow, at 4,000*l.*

WATER PIPES IN FROST.

SIR,—About five years since you inserted a letter from me suggesting what I still think would afford a remedy against the bursting of pipes by freezing. If the pipes were squeezed to a slightly elliptical form before fixing, the expansive force of the freezing mass inside would gain room by restoring the circular shape, and even if the lead is not sufficiently elastic to revert to the elliptic form after a thaw, it would still take a series of frosts before the unyielding circular form is attained. Objection was made that the longer axis of the ellipse having to contract against the expansion of solid ice, the elliptic form would be impracticable, but if the opinions of your recent correspondents and myself are correct, the objection would fail. Supposing the other view to be correct, it would be easy to find, though not so economically, a suitable section for a pipe that would yield readily to the uncompromising equal expansion of a solid mass. Perhaps the simplest form would be a corrugated circle, or a more convenient shape for fixing to wall would approach a D shape, the flat side being made slightly concave.

F. H. MCLAUCHLAN.

"FROST AND MORTAR."

SIR,—With regard to the position of contractors and their liabilities respecting the above matter, permit me to submit the following remarks:—

In the first place, I presume that your correspondent "Contractor" is now engaged in performing his part of a contract,—hence his query. I must also suppose that his contract is as stringent as contracts usually are,—namely, that he has agreed with the other party to his contract to do, make, form, complete, and deliver to the other party whatsoever on his part, with the materials, and subject in every respect to all the terms, conditions, and provisions contained in the specification and drawings, for a certain consideration, say the amount of his tender. There is, doubtless, a condition in his contract that on the certified completion of the works by the engineer or architect, the contractor shall, or within a stipulated time after, receive his retention-moneys.

Now, sir, you will observe the absolute necessity of "Contractor" having a certificate of similar import as the one described, because it is a condition precedent to his being entitled to receive the balance of the consideration for his contract. Again, the law presumes that he has exercised sufficient diligence in the preparation of his estimate, thereby providing ample means in his estimate to meet all contingencies that he might come in contact with, other than deviations of great magnitude from the original contract. "Contractor" will also perceive that he will have to make good, at his own expense, all damages that might have been caused by frost or other sources other than by the act of his employer, to ensure his eligibility in being entitled to the necessary certificate.

In conclusion I may say that his liability depends in a great measure on the construction of his contract.

G. W. FRANCE.

Water Pipes.—At a meeting of the Royal Scottish Society of Arts, on the 24th ult., communications were submitted on a "Method of adjusting the sizes of branching water-pipes," by Mr. John Sang, C.E., Kirkcaldy, and on a "Cause of the bursting of water mains, and the cure of it," by Mr. Edward Sang.

SPECIAL WORKS AND BUILDERS' CONTRACTS.

SIR,—IT would be desirable if every architect would adopt the suggestion thrown out by Mr. Florence, the president, at the meeting of the Architectural Association of the 14th ult., and reported in the *Builder* of the 1st inst., to exclude certain branches of the work from the contract. Its advantages are so important to everybody, that no architect ought to act otherwise. Though, as Mr. Florence justly remarks, it might give him more work, he is certain to benefit his client to a large extent, who would get his work done cheaper and better,—cheaper, as the additional profit put on by the contractor when a speciality is provided for is saved, besides the black mail levied by him for the payments he makes, although he rarely does so before he receives them from the client, and which the specialist has to include in his amount, as well as the risks he runs in not being paid at all, the majority of builders being very fond of paying in bills, which would certainly be avoided if the client paid direct; better, as every specialist takes his trade to heart, and must satisfy the architect, to whom he has to look for future work, and therefore the client gets superior work at a lower rate. The builder naturally goes to the cheapest market, sacrificing art to interest. I believe these advantages are great, and we poor specialists ought to be grateful to Mr. Florence for having mentioned them, and this course ought to be adopted, as it is in France, to the interest of client and satisfaction of architect.

SPECIALIST.

APPRENTICESHIP.

SIR,—I am apprenticed as a builder's clerk; before my time has expired, my employer is compelled to compound with his creditors; he offers 20*s.* in the pound, which offer is accepted, and he is allowed two years in which to pay. In the meantime he decides to relinquish the building trade and carry on that of an architect and surveyor. Being bound as a "Builder's clerk," should I be compelled to complete my apprenticeship, or are the indentures cancelled by these proceedings?

H. C. B.

STATUES.

William Harvey.—The models by the three artists who were invited to furnish designs for the statue of Harvey, the physiologist, which is to be erected at Folkestone, his native place, are, by permission of the Lords of the Committee of Council on Education, now being exhibited at the South Kensington Museum, and will remain on view until March 29th, from ten a.m. to four p.m. daily.

Captain Cook.—The statue of Captain Cook, which has been erected in the Hyde Park, Sydney, was unveiled on the 25th ult., by the Governor, Sir Hercules Robinson. The statue is by Mr. Woolner, and was the subject of some remarks in last year's volume of the *Builder* (p. 717), on the occasion of its temporary erection in Pall-mall.

PARLIAMENTARY JOTTINGS.

Manchester Water Supply.—In the House of Commons, on the 27th ult., the Manchester Corporation Water Bill was read a second time, and ordered to be referred to a select committee.

Thames River Floods.—In the House of Commons, on the 28th ult., the Thames River (Prevention of Floods) Bill, was, on the motion of Sir J. McGarel-Hogg, read a second time and referred to a select hybrid committee.

Ancient Monuments.—On the House going into committee, on the 28th ult., on the Ancient Monuments Bill, Earl Percy moved that progress be reported. Sir J. Lubbock and Mr. Beresford-Hope were desirous of the measure being allowed to proceed. The House then divided, when the motion to report progress was negatived by fifty-four to thirty-eight. The motion for adjournment was withdrawn, and the Bill was read a third time and passed. It is stated that Earl Percy proposes to stop the further progress of the Ancient Monuments Bill on Monday next by moving that the consideration of the amendments made in committee be postponed for six months. [The Bill, as amended in committee, confides the duty of seeing after the preservation of ancient monuments to the Trustees of the British Museum.]

MESSRS. MERRYWEATHER AND SON'S NEW FACTORY, AT GREENWICH.

THESE works are being modernised, and several new buildings are being erected: when finished, there will be room for upwards of 1,000 workmen. The smithy is already completed: it has fourteen fires and a steam-hammer. Labour-saving machinery is being largely adopted. Messrs. Smith & Coventry, Muir & Co., and Shepherd, Hill, & Co. have each orders in hand for such appliances for these works.

These premises were taken by Messrs. Merryweather, about two years since, for the manufacture of tramway engines, and already upwards of ninety such engines have been turned out. Rails upon which to test these engines are being laid down, and there is a creek to the Thames upon which the steam fire-engines can be tested.

Mr. Jerrard, of Lewisham, is the builder, Mr. Tabberer, the architect.

MASTERS AND MEN.

Huddersfield.—The masons in the employ of the Huddersfield Corporation struck work on the 27th ult. against an attempt to increase their working-hours from 8 to 8½ hours. In consequence, the building of the new Town-hall and the covered market is suspended.

Bangor.—After a month's strike, the majority of the bricklayers and carpenters employed in the building trade at Bangor resumed work on the 24th ult. upon the employers' terms,—an extension of hours.

Greenock.—The Greenock operative masons have resolved to submit to a reduction of ½d. per hour on their wages, and consequently the threatened strike will be averted. The men at a meeting have, however, denounced the action of the masters as a "piece of tyranny," inasmuch as they had had three reductions since November, since which time they had had only about a fortnight's work in consequence of the frost.

The Brickmaking Trade.—On Monday a meeting of the master brickmakers of the London suburban district was held at the Cannon-street Hotel, for the purpose of discussing the wages question in their trade and to decide on the reduction to be made in wages during the ensuing season. A motion that the reduction should be 6d. per 1,000 for moulding was unanimously agreed to. The following were elected as a committee to draw up a scheme for the formation of a Brickmasters' Central Association: — Messrs. Warburton, Richardson, Lee, Pocock, Rhodes, Featherby, Lout, Harris, Wright, Burchett, Collis, Colson, and Nichola.

Federation of Trade Unions.—At a meeting of the Birmingham Trades Council on the 1st inst. a resolution was passed in favour of establishing a federation of trade unions. It was stated that the trades councils of Derby, Leicester, Bristol, Walsall, Wednesbury, and Wolverhampton were willing to join the Birmingham Trades Council in forming the federation, and that the members of these unions represented ninety trades and about 15,000 workmen.

Sunderland.—At a general meeting of the house-painters of Sunderland, it has been unanimously resolved to accept no reduction on the present rate of wages, 7½d. per hour.

Forfar.—The master joiners of Forfar have reduced the wages paid to their men ½d. per hour.

Dunfermline.—The Dunfermline masons have received notice that their wages will be reduced to 6d. per hour.

Newcastle-on-Tyne.—The joiners' strike here still continues. This is the twenty-fifth week of its duration. Before the strike the men were being paid 8½d. per hour, and the masters, owing to the slackness of trade, proposed to reduce the rate of payment to 7½d.

Dumfries.—The threatened strike of masons at Dumfries has been averted. On the 28th ult. a meeting of representatives of masters and men was held, when a compromise took place. The men agreed to the reduction to 7d. per hour, provided no further reduction took place for twelve months, and the masters promised this.

Edinburgh.—The *Scotsman* understands that a number of the master builders in Edinburgh have given the masons in their employment notice of a reduction of wages at the rate of 1d. per hour, the same to come into operation on and after Saturday, the 8th. This will bring the rate of remuneration per hour down to 6d., being 3d. per hour or 12s. 9d. a week less than the standard rate of wage paid to masons prior to May last.

Books Received.

Elementary Text-book of Physics. By J. D. EVERETT, M.A. Blackie & Son.

THIS is a text-book for elementary classes, and presents those portions of theoretical physics which are, in the opinion of the author, most essential as a foundation for subsequent studies.

Dynamics, hydrostatics, heat, light, sound, aad electricity are the subjects upon which the author,—Professor of Natural Philosophy in the Queen's College, Belfast,—treats in this little book: of course, therefore, briefly on each.

In England we usually speak of pounds weight and of feet measures, and therefore of foot-pounds as units of force, but the author puts weights into grammes and measures of length into centimètres, and makes the unit of force that which, acting for one second of time upon a mass of one gramme, produces a velocity of one centimètre per second, and this is called the *dyne*; and the unit of work which the author adopts is the force of one dyne working through the distance of one centimètre, and this is called the *erg*.

It may be very well to adopt these values as units, for, taking weights and measures universally, there are certain conveniences in using them, a gramme being the weight of a cubic centimètre of distilled water, but it would have been very proper, we think, if the author had set forth,—as writers of more important works on physics have thought it proper to do,—the relations which subsist between the method adopted by the English nation and that which he prefers to teach.

Miscellanea.

Union Bank Buildings, Glasgow.—The alterations and additions which have been in progress for several months at the head office of the Union Bank in Ingram-street, Glasgow, have now been completed, and on the 24th ult., the new portion was opened for the transaction of business. The old front has been entirely demolished, and a new one substituted, which gives 46 ft. additional frontage, making in all 105 ft., while the building extends backwards a distance of 132 ft. The style adopted by the architect, Mr. Burnet, is Italian, freely treated. The basement of the building is of polished Peterhead granite, while a range of sixteen granite pilasters of the Doric order, relieve the masonry of the second story. Ornamented trusses rise between these, and form the basis of pedestals on which are placed a series of sculptured figures. On the third story is a range of Corinthian pillars, all in polished granite of the same character, the entablature, which is of rich design, being surmounted by a balustrade in harmony with the general architecture of the façade.

Birmingham Wire and Metal Gauge.—The annual report of the council of the Birmingham Chamber of Commerce says:—"Your council have had under consideration the great inconvenience and uncertainty arising from the existence of a number of varying wire and metal gauges, and have been in communication with Sir Joseph Whitworth and other authorities. They find the subject surrounded with great difficulties, but it is extremely desirable that an authorised and uniform standard gauge should, if possible, be constructed and based upon some definite principle, such as the decimal divisions of an inch. In process of time such a gauge might be universally adopted, and your council invite the co-operation of any members of the Chamber possessing a special knowledge of the subject."

Public Works in Ireland.—There has been issued an account of receipts and payments by the Commissioners of Public Works (Ireland) on account of the Irish Reproductive Loan Fund for the year ended the 31st December, 1878. The number of loans made during the year was 275, and their amount 4,878*l.*; the total number of loans since the passing of the Act being 1,078, and the amount advanced 19,352*l.* The repayments to the end of last year amounted to 10,776*l.* 3s. 6d.

British Archæological Association.—At the fifth meeting of the session, it was announced that the Council had resolved to undertake some excavations at Castor, Northants, on the supposed site of the Roman Station, Durobrivæ, with a view to recommencing the work of exploration left by Mr. Artis fully fifty years ago. A sum of money had been collected, and a local committee was in course of formation in aid of this object. Mr. Loftus Brock exhibited fragments of two Roman tesselated pavements which have been recently met with in London in course of building works. One was from Billiter-square, and the other from the south side of Cheapside. The first paper was by Mr. G. Patrick, who entered into the history of Burleigh House with great minuteness, illustrating his subject with many plans and views, including some of old date, as well as copies of Thorp's plan. The question of Thorp having been the architect was discussed, and the evidence is in favour of this, although there is evidence that Gresham brought materials for the work from Flanders, and that Gresham's architect directed this part of the work. The dates 1577, 1585, and the latest, 1587, occur on the building, and thus disprove the belief that the house was not erected for Lord Burleigh, but for the Earl of Exeter, his son. There are historical evidences of the existence of an earlier house, and traces still exist. A resolution was passed to urge the Mayor and Corporation of Newcastle in favour of their preserving the Carliol Tower, one of the most interesting relics of the fortifications of that town, and which is threatened, as we have already said, with destruction.

Archæology and the Universities.—A memorial to the University Commissioners is being circulated for signature, praying them to make provision for the establishment of an English school of archæology abroad, such as the Governments of France and Germany maintain at Rome and Athens. The memorial suggests that by joint action of the two Universities of Oxford and Cambridge a fund should be provided for the establishment of one or more studentships of 300*l.* per annum, tenable for three years, on condition of residence for nine months in each year in Italy, Greece, or Turkey, and of sending periodical reports of work done or researches made.

Engineering at University College, London.—At the annual meeting of the governors of University College, held on the 26th ult., much satisfaction was expressed at the completion of the Technical Laboratory for Engineering, which has long been a desideratum in the college, and which was visited by several of the governors, who were received by Professor Kennedy. The laboratory is furnished with a testing-machine of great power, in addition to various other appliances for teaching the engineering students the practical application of much that they learn in the lecture-room. On the motion of the Rev. H. Solly, seconded by Mr. J. Chisholm Gooden, the following resolution was put and carried unanimously:—"That the governors desire to express their gratification at the opening of the new engineering laboratory for the use of students at this college; and they trust it will be extensively useful both to the students and in furtherance of engineering science generally, by affording eminent members of the profession opportunities for important experiments under the able superintendence of Professor Kennedy."

Dwelling-houses: their Sanitary Construction and Arrangements.—This is the title of a course of six Cantor lectures now being delivered under the auspices of the Society of Arts by Professor Corfield. The first lecture was on situation and structure; the second on ventilation, warming, and lighting; and the third, delivered on Monday evening last, was principally devoted to the subject of water supply. The lecturer said that the system of constant service, which is now gradually being adopted, is preferable in every way to that of intermittent service. But it is necessary to have duplicate reservoirs in order that the water may not be supplied intermittently while the reservoirs are being cleaned out, as serious results may ensue, as was the case at Croydon. With the intermittent service, galvanised iron cisterns, or, for cottages and basement floors, the new stoneware cisterns are the best, and in every case the waste or overflow pipe should discharge in the open air. The lectures are illustrated by specimens from the Parkes Museum of Hygiene at University College.

Liverpool Engineering Society.—At the last meeting of this society, held at the Royal Institution, Mr. M. E. Yeatman, M.A., in the chair, a paper on "The Design and Construction of Sewers" was communicated by Mr. Graham Smith, past president. In opening his subject, he remarked that sewers should not only be constructed in a manner to carry with despatch to the outfall the sewage which might find its way into them, but they should likewise be built in such a manner that no portion of the sewage should percolate through them into the surrounding earth. He quoted the general Board of Health returns to show that zymotic diseases largely exist, and are much due to improperly-constructed sewers and imperfect drainage arrangements. The question of the proper forms of sewers to be adopted under various circumstances was dealt with at some length, and the author advocated the circular section when a large and constant flow could be depended upon, and the egg-shaped sewer when a variable flow had to be accommodated, as the smallness of the invert increases the scouring action of a small quantity of sewage, whilst the increased size of the upper portion provides for any augmentation of flow.

Northampton Castle.—The answer of the chairman and directors of the London and North-Western Railway Company to a memorial lately sent them for the preservation *in situ* of the old wall, with the postern doorway, has at length been received. The request of the memorialists has not been complied with, although the directors have made some concession to the appeal. They say "that the intention is to take down the postern doorway and rebuild it in the boundary wall of the station, which wall it is also proposed to face with the ashlar veneering of the castle-wall. Every care will be taken in removing the old stone-work to be re-used, and the portions forming the postern doorway will each be numbered, so that they may be reinstated in the same relative positions (on their new site) that they now hold." Much disappointment is felt by the Castle Committee at the answer of the company, and it was resolved that, in acknowledging its receipt, an appeal should be made to the directors to cause a gun-metal plate to be affixed to the wall near the postern doorway in its new position, to contain an account of the removal.

A New Method of Working Coal-mines.—At the ordinary monthly meeting of the Manchester Geological Society, on the 25th ult., a paper was read by Mr. W. E. Garforth, on "The advantages of compressed air at high pressures (8,000 lb. and upwards per square inch) as compared with blasting by means of gunpowder or other explosives." In the course of his remarks Mr. Garforth observed that Messrs. Garforth, of Dukinfield, had constructed a machine for bursting down coal instead of blasting it with gunpowder, by which 14,200 lb. pressure per square inch of compressed air had been obtained. The machine was a portable one; it could be worked by two men, and its dimensions made it suitable for small mines. Trials had been made with the machine for some time past, and on the 24th ult. experiments were conducted at the Bower Colliery, Hollinwood. The machine on that occasion, working at a pressure of 9,550 lb. to the square inch, broke down from five to six tons of very hard coal. Part of the invention related to a drilling-machine, patented by Mr. Ernest Reuss, of Manchester. The merit of Mr. Garforth's machine is, however, claimed by Mr. Samuel Marsh, by virtue of a patent obtained by him in 1876.

Excavations and Foundations in Sand. M. Plocq has published an interesting note upon the recent harbour improvements at Dunkerque and Gravelines. There are ten sluices for controlling the fresh and salt waters of the districts, for various purposes of maritime and domestic economy, as well as for the wants of the military service and for defensive operations in time of war. The sluices are built in a soil which is wholly made up of pure sand, of flour-like fineness, reaching to a depth of 15 or 20 mètres (16·4 to 21·9 yards) below the lowest tidal levels. The works were all executed by the help of coffer-dams, in preference to dredging, and the preparations were so thorough that it was always easy to work in dry sand even at the lowest foundation levels. The total cost was less than half what it would have been by the whole method of dredging, and the saving of time was in about the same ratio.—*Ann. des Ponts et Chaussées.*—C.

Vinovium. — An interesting lecture was delivered in the Town-hall, Bishop Auckland, by the Rev. R. C. Hooppell, LL.D., rector of Byers Green, on the Roman station of Vinovium, the modern Binchester, near Bishop Auckland. The lecturer began by describing the successive wave of Gaelic, Cymric, and Teutonic immigration into Western Europe and Britain, the third wave coming after an interval of several hundred years, during which the Romans, to whom we owe so much in language and literature, laws and religion, acted as a mighty breakwater, stemming back the advancing Germanic hordes. These successive arrivals on our shores, each bearing its traces in the names of rivers, mountains, and towns or villages, were rather absorbed than annihilated by their respective followers, so that our present population combines the blood of them all. Quoting largely from Tacitus, the lecturer described the desperate struggles between the Roman invaders of Britain and the tribe of Brigantes, the most powerful of all the British tribes, who held the territory now covered by the counties of Yorkshire, Durham, Lancashire, Westmoreland, and Cumberland. Vinovium was one of their strongholds, and was not captured by the Romans till the time of Hadrian, about A.D. 120. It was Hadrian who reared the great wall across the island from the Tyne to the Solway, and to him are attributed the strongly fortified stations on the main roads to the south of the wall, such as Corbridge, Ebchester, Lanchester, Catterick, and others. These stations all lay on the Watling-street which ran from York,—for centuries the head-quarters of the 6th Legion, originally brought to Britain by Hadrian,—through Vinovium to the central districts of the great wall. The more eastern route passed from York through Thirsk, Northallerton, Sadberge, Stainton-le-Street, and Old Durham, to Jarrow and South Shields.

Launch of a Steamer on the Tyne.—Last week there was launched from the yard of Messrs. Wigham Richardson & Co., a screw steamer of 3,000 tons burthen, for the Royal Exchange Shipping Company of London, whose steamers are managed by the well-known firm of John Patton, jun., & Co. This steamer was christened the *Celtic Monarch*, by Miss Constance Wawn, and immediately after the launch the ship was taken under the builders' shears to receive her machinery, which is a duplicate of that of the *Alton Tower*. The engines are especially designed so as to develop their full horse-power, with a fewer number of revolutions than has hitherto been the current practice. It may make the matter clearer to a non-professional mind to state that the tips of the fans of the *Celtic Monarch's* propeller will revolve even at the fifty revolutions, which is her destined pace, over twenty knots an hour. The *Celtic Monarch* is 300 ft. long, 35 ft. beam, and 25 ft. deep, with full poop, topgallant forecastle, bridge, houses, and every requisite in outfit and spare gear for her destined voyage.

Amateur Work.—A set of altar-rails has just been erected in Mytton Church, which is an ancient ecclesiastical structure, and celebrated as the resting-place of the Sherburnes. The church is situated on the western borders of Yorkshire, overlooking the Stonyhurst Roman Catholic College, and immediately adjoining the river which divides Lancashire from Yorkshire. The altar-rails are the gift of Mr. John Hicks, the senior member for Bolton, and Mr. R. J. Aspinall, of Standen Hall, near Clitheroe, and a special interest attaches to the gift from the fact that the rails are the sole work of Mr. Hicks, one of the donors. A new stained-glass window is about to be erected at the east end of the old edifice, the present window being in a very dilapidated condition.

Wyld's New Maps of Zulu Land and South Africa.—Many will be glad to know that Mr. Wyld has published a Military Sketch of Zulu Land, Transvaal, the Frontiers of Natal, and the Orange Free State, with the Portuguese possessions around Delagoa Bay, showing the kraals and military localities of Zulu Land, with the military positions, on a scale of ten miles to the inch. This part of the world has become very important in the eyes of Englishmen.

Westminster Abbey.—Mr. John Pearson has been appointed to the office of architect and surveyor of the fabric of Westminster Abbey, vacated by the lamented death of Sir Gilbert Scott. The special works already commenced by Sir Gilbert Scott will be continued by his son, Mr. John Oldrid Scott.

Dr. Schliemann at Work.—Extracts from private letters recently received from the East are published in the *Carlow Sentinel*. The writer says:—"The next day we rode out to Ilium Novum, Schliemann's Troy, and found Schliemann himself there, excavating the foundations of Priam's Palace from a heap of ashes, and picking out gold and silver ornaments every five minutes. He was very kind, and took any amount of trouble to explain the different sites he had dug into before he discovered the ashes of the big fire which laid the first Troy in ruins. He has 200 men working, and has cleared off an astounding amount of *débris*, until, at about 30 ft. from the surface, he has disclosed the massive substructures on which Priam's Palace of wood and the lofty tower were built. Most of the things he has found, such as gold earrings, necklaces, hair-pins, &c., are rather spoiled by fire; in fact, the whole of the deeper diggings showed on stones and everything the effects of severe fire. Schliemann is, of course, an enthusiast, and talked to us for a couple of hours explaining things, but all the time keeping a sharp eye on the diggers, to prevent them bagging any of the gold objects they found. He manages the natives well, pays them so much a day, and at once gives baksheesh to any man who finds the smallest thing and brings it to him. While he was spouting Homer and Virgil to us, a native would rush up and shove something under the old chap's nose, shouting 'Bak-sheesh!' He paid according to the value, a penny for stone hammers, knives, spindles, &c., and half a franc for gold and silver things. He found this requisite, as the lazy beggars would not half examine the rubbish. Schliemann treated us to coffee and wine in his shanty, and presented each of us with a stone hammer, spindle, and earthenware jar to match. He would not lunch with us, he was 'too busy.'"

Public Works Loans.—The Chancellor of the Exchequer's Bill relative to loans for public works has been printed. It provides that no borrower shall in any one financial year obtain from the Public Works Loan Commissioners a larger loan than 100,000*l*. Another of the provisions relates to the amount of interest to be paid. Under the Act of 1875 the rate of interest was fixed at not less than 5 per cent., save in cases where a rate was authorised by the special Act allowing the loan, when the rate was to be not less than that so authorised. The Bill now further proposes, with regard to these latter cases, that whatever may be the rate authorised by the special Act, the interest shall also be not less than 3¾ per cent., if the period within which the loan is repayable does not exceed thirty years, and not less than 4 per cent. if the period is between thirty and forty years, and not less than some sum as yet unnamed if the period exceeds forty years. The repayment is no longer in the form of an annuity, as was allowed by the Act of 1875. It is not proposed that the measure shall apply to any loan granted before the 1st of April, 1879, or to any instalments subsequently advanced in respect of such loan.

Thames Floods in the Metropolis.—On the 25th ult. a conference of delegates representing the Vestry of Lambeth and the district boards of Fulham, Wandsworth, Westminster, and St. Saviour's, was held at the Lambeth Vestry Hall, to consider the present position of this question. The subject was considered by a Committee of the House of Commons in 1877, and the Committee reported that the works necessary to prevent the floods ought to be executed by the Metropolitan Board, at the cost of the entire metropolis. It was resolved "That this Conference expresses its regret that, notwithstanding the decision of the Select Committee of the House of Commons of 1877, the Metropolitan Board is prosecuting a private Bill based on the principle of charging owners and localities with the expense of preventing the overflow of the Thames;" and "That the Home Secretary be respectfully requested to receive a deputation before the second reading of the Bill in the House of Commons."

St. Mary-at-Hill, Eastcheap.—With reference to the threatened destruction of Wren's church of St. Mary-at-hill, Eastcheap, by the Metropolitan and Metropolitan District Bill for the Inner Circle Railway, it is satisfactory to learn, on the authority of Mr. Percy Wyndham, that the railway companies have agreed to insert a clause in the Bill which will ensure the complete preservation of both church and churchyard.

Lighting of Lighthouses.—While the engineer had attained some of his greatest triumphs in the construction of lighthouses, the optician had not once directed his attention to the invention of a brilliant light, worthy to be placed upon the structure which proudly rose high above the fierce waves with the strength and solidity of a rock. During a period of forty years after the completion of the Eddystone tower by Smeaton, the lantern was illuminated by tallow candles stuck in hoops, just as a stand or booth is lighted at a country fair, and so lately as the year 1811 it was lighted with twenty-four wax candles. In 1812 the Lizard Light was maintained with coal fires; and in 1816, when the Isle of May Light, in the Frith of Forth, was taken possession of by the Commissioners of the Northern Lighthouses, a coal fire was exhibited in a *chauffer*,—a description of light which had been exhibited for 181 years. In 1801 the light at Harwich, in addition to the coal fire, had a *flat* plate of rough brass on the landward side, to serve as a reflector. Such methods of lighting were, of course, very deficient in power, and did not enable the mariner to distinguish one light from another,—a point which is often of as much importance as the brilliancy of the light itself. Prior to the invention of the Argand lamp (about 1784) the production of a strong and brilliant light from a single source was scarcely possible, and even such a lamp, by its unassisted powers, would not be of very great value in giving early notice to the mariner of his approach to the coast, which ought to be the primary object of a lighthouse. As the rays of a luminous body proceed in all directions in straight lines, it is obvious that in the case of a single lamp the mariner would derive benefit only from that small portion of light which proceeded from the centre of the flame to his eye. The other rays would proceed to other parts of the horizon, or escape upwards to the sky, or downwards to the earth, and thus be of no value to him. By increasing the number of burners a small portion of light from each burner would slightly increase the effective action, but by far the greater portion of the light produced would escape uselessly above and below the horizon, and also at the back of each flame. Next, these defects were remedied, and the efficiency of the light greatly increased, by placing behind each lamp a reflector of such a form as to collect the rays that would otherwise be lost, and throw them forward to the horizon. The adoption of such a method has led to what is called the catoptric system of lights.—*The Sea: its Stirring Story of Adventure, Peril, and Heroism.*

Edinburgh.—The North Canongate school, the ninth which has been built in Edinburgh since the passing of the Education Act for Scotland,—was opened on the 7th ult. It is situated in Cranston-street, and is one of the largest schools in the city. It has accommodation for 1,050 children, on the eight square feet standard per child. It is built in the Scottish baronial style, and has a frontage to the north. There are separate playgrounds and entrances for the two sexes. The infants' department is on the ground floor, and consists of a hall, one large class-room, and two smaller ones. On this floor accommodation is provided for 360 infants. The second floor is devoted to the pupils in the three lower standards; the accommodation consists of a hall, a large double class-room, a smaller one, and a spacious sewing-room. On this floor there is accommodation for about 360 pupils. The top floor, which affords accommodation for 240, is occupied by the children in the higher standards, and comprises a hall and two commodious class-rooms, one of which is specially fitted up with a view to the senior class carrying on all branches of study in it, including drawing,

Infirmary for the Barton Union, Manchester.—At a meeting of the Barton Board of Guardians on the 26th ult., the Clerk read the minutes of the house committee, which stated that at its last meeting Mr. Barker (of the firm of Messrs. Barker & Ellis, architects) had attended and presented plans for the erection of a new infirmary for the union, at a cost of 9,928*l*. The committee recommended the plans for the approval of the guardians.

Dudley Gallery: Water-Colour Drawings.—The fifteenth general exhibition here of water-colour drawings is now open, and includes 642 works, mostly indifferent. It would be little less than a waste of time and space to give any detailed account of them.

Scene-painting.—A good deal of space is given up in the Museum of Decorative Arts, Paris, to the designs of scene-painters,—cruellest of reproaches to an artist in the opinion of the true American! Ah! If the young genius who is crushed when scoffed at as not being fit to be a "scene-painter" could realise the honour in which the leaders of that profession are held here, he would take courage, and, genius though he be, perhaps condescend to undertake one of the grandest branches of art. Certain it is that the development of modern theatrical representation has opened a splendid field to the true artist, where not only can he display every quality of colour and composition of landscape-painting on a monumental scale, but people them with magnificent masses of shifting colour. Nothing contributed more to the renown of one of Germany's greatest artists, Schenkel, than his designs for opera scenery; and the French set apart in the late Exhibition a special room in the Beaux-Arts section to display a series of miniature stages, with the scenery of well-known dramas and operas, from the theatre of Corneille in 1636, to the more sumptuous settings, beginning with "William Tell" in 1829, down through all the elaborate *mise-en-scène* which has distinguished the French stage, to the unparalleled magnificence of the new Opera-house. But even here I do not think the merited celebrity is given to the scene-painters. The name of the painter of an interesting picture at the *salon* is on every one's lips, but out of the thousands who are enthusiastic over the beautiful scenery in the theatres,—and which alone will often draw full houses,—few ask the name of the painter, and beyond the real art-world he is not much known. It would but be fair to have the painter's name upon the playbill; as he always receives his share of attention at the *première*, why not afterwards? Among the foremost of these artists are the two Lavastres, the younger of whom, for his noble scene in the second act of "Don Juan," received the Cross of the Legion of Honour. Chéret received a like distinction for scenes in "Le Roi de Lahore" and other operas, while the elder Lavastre, Carpezat, Daran, and Rubé had *diplômes d'honneur*. All these are men of the highest artistic powers, and deserve to rank with the best painters.—*American Architect.*

North Wales Slate Trade.—The slate trade of North Wales, after being in the most depressed state experienced for many years past, is at length presenting some signs of improvement, the management of Mr. Assheton Smith's quarries at Llanberis, which are among the largest in the Principality, having notified their intention of working the quarries four instead of three days weekly. At Lord Penrhyn's Bethesda quarries the men continue working four days weekly, but on the 22nd ult. nearly 300 were paid off; and the smaller quarries are still working with the smallest possible staff, many preferring to close in lieu of increasing stock.

New Clocks.—An "In Memoriam" turret-clock has just been fixed in the tower of St. Mary's Church, Burrough-on-the-Hill, near Melton Mowbray, the gift of Capt. Burnaby, and the work of Mr. J. W. Benson, of Old Bond-street and Ludgate-hill. The time is shown on two dials, 4 ft. 6 in. diameter, painted blue with gilt figures.——A turret-clock has just been fixed in the tower of Highcliffe Church, near Christchurch, by the same manufacturer. The time is shown on a copper dial 3 ft. 6 in. in diameter, and the clock strikes the hours on a bell of 5 cwt.

Suffolk.—All Saints' Parish Church, Hopton-by-Thetford, Suffolk, in the diocese of Ely, is about to be restored from the designs of Messrs. Satchell & Edwards, of London. For the execution of the work the tender of Mr. Brooke has been accepted.——The restoration of St. Margaret's Parish Church, Wattisfield, in the same county and diocese has also been entrusted to the care of Messrs. Satchell & Edwards.

How the Actors do it in America.—According to the American *Plumber*, "Mr. Dion Boucicault's bath-room, floor and ceiling and walls, is made of blue china tiles. The doors are heavy plate mirrors set in ebony, and the bath is a huge marble basin, with water coming in fountain-fashion from the bottom."

The Two Dukes.—Life-size marble medallions of the late Duke of Wellington and the first Duke of Marlborough are to be placed in the Guards' Chapel, Wellington Barracks. Mr. George G. Adams, sculptor, of Sloane-street, has been commissioned to execute them.

Bristol Master Builders' Association.—The annual banquet of the Master Builders' Association, elsewhere mentioned, was held on the 27th ult., at Clifton, when about seventy friends were present. Mr. W. H. Cowlin presided, and, on behalf of the members of the association, presented Mr. J. Yallaun, ex-president, with a drawing-room clock and ornaments.

A Protest from Fulham.—The Metropolitan Board of Works are endeavouring to pass a Bill through Parliament to impose upon the Fulham district the total cost of embanking its river frontage. Public meetings have been held to protest against this, which certainly seems unjust, considering that Fulham has had to pay towards embanking the river elsewhere.

Town-hall for Hove.—At a special meeting of the Hove Commissioners, on the 1st inst., it was resolved, on the recommendation of the Town-hall Committee, to adopt the plans prepared by Mr. Waterhouse, A.R.A., for the proposed new Town-hall, and it was also decided to take steps to commence the work at once. The materials of which the exterior is to be constructed are red brick and terra cotta.

St. John the Evangelist, Bromley, Kent. The committee for the erection of this church having lately invited five architects to compete, have received the designs, and selected those by Mr. George Truefitt, of Bloomsbury-square.

Dangers of Window-cleaning. — The Liverpool borough coroner has just held inquests upon the bodies of two women killed through falling from windows which they were engaged in cleaning.

Castleisland, Co. Kerry, Ireland.—Out of seven designs sent in for a new (R.C.) church at Castleisland, Co. Kerry, Ireland, that submitted by Mr. D. J. Coakley has been selected. The church is to cost 8,000*l*.

Victoria (Philosophical) Institute.—At a meeting held on Monday, Prof. M'K. Hughes, F.R.S., delivered a lecture upon "The Antiquity of Man," in which he analysed the nature of the evidence brought forward by others.

TENDERS

For alterations and additions to the Workhouse, Llanrwst. Mr. T. Roberts, architect:—

Parry	363 0 0
Hughes	360 0 0
Rees	360 0 0
Jones (accepted)	325 0 0

For the erection of a shop, dwelling-house, and two cottages in the Cromwell-road, Redhill. Messrs. Smallpeice & Bishop, architects:—

Apted, Brothers	£865 0 0
Worsfold	823 16 0
Stoneman & Sons	720 0 0
Scougal (accepted)	665 15 0

For completing eight houses at Tulse Hill Gardens, for Mr. W. S. Iles:—

Holliday, jun. (accepted)	£425 0 0

For alterations and additions to No. 59 and 60, Cornhill, for Messrs. Harvey & Davids. Mr. B. Tabberer, architect:—

Marks	£194 0 0
Johnson & Co. (accepted)	160 0 0

For alterations to new premises, Great Eastern-street, for the Hon. Mrs. Geo. Brown:—

Johnson & Co. (accepted.)

For block of model dwellings, Aske-street, Hoxton. Mr. T. C. Clarke, architect:—

Wheeler	£20,445 0 0
Conder	20,429 0 0
Colls & Son	20,378 0 0
Browne & Robinson	20,172 0 0
Clarke & Bracey	19,520 0 0
Grover	18,598 0 0
Ashby, Brothers	18,323 0 0
Macey & Sons	18,315 0 0
Patrick & Sons	17,923 0 0
Ashby & Horner	17,620 0 0
Pritchard	17,519 0 0
Laurence	16,461 0 0

For alteration and additions to Rodford Cottage, Chelmsford-road East, Woodford:—

Willis (accepted)	£624 9 9

For erection of residences and photographic studio for Mr. W. Perry, Sandgate. Mr. Burgess J. Reeve, architect:—

Payne (accepted).

For partial restoration and new bell-floor to tower of the Parish Church, Folkestone. Mr. Burgess J. Reeve, architect:—

For new Bell-floor, &c.

Holdom	£192 10 0
Dunks	175 0 0
Brooks (accepted)	164 0 0
Prebble	130 0 0

For Tower Restoration.

Brooks (accepted)	211 8 9

For alterations, &c., to 16, Clifton Gardens-street, Folkestone, for Mr. R. Henderson. Mr. Burgess J. Reeve, architect:—

Brooks (accepted)	£115 7 7

For completing a block of four shops and three houses at Plaistow, E., for Mr. F. Sewell. Messrs. Walter Graves & Hulbert, architects:—

Ellis (accepted)	£690 0 0

For the erection of two houses and shops at Streatham Common, for Mr. E. Janes, Sen. Mr. Cruwys, architect. Quantities not supplied:—

Evans	£1,400 0 0
Tibbett & Adams	1,398 0 0
Mason	1,323 0 0
Bassett & Sons	1,250 0 0
Smith, R. & E.	1,225 0 0
Simons (accepted)	1,125 0 0

For the Norfolk and Norwich Hospital (new building, old building, and chapel). Messrs. T. H. Wyatt & E. Boardman, architects:—

	All kiln bricks.	Clamp bricks and kiln facings.
Brummage	£58,343	£56,875
Holland & Hannen	57,733	57,333
Dove, Bros.	56,160	55,890
Lucas, Bros.	55,862	55,495
Hill & Higgs	54,520	54,200
Braid & Co.	53,960	53,594
Cornish & Gaymer	51,279	50,904
John Downing	48,811	48,076
J. W. & H. Lacey	45,600	44,450

For the erection of Wesleyan school, chapel, vestries, &c., Plymouth Grove, Manchester. Quantities supplied. Messrs. Hetherington & Oliver, architects:—

Danbrough	£4,470 0 0
Burton & Sons	4,420 0 0
Shaw	4,340 0 0
Hurst	4,325 0 0
Howard & Co.	4,200 0 0
Statham & Sons	3,943 0 0
Ward	3,900 0 0
Butters & Carson	3,890 0 0
Davies & Mawdesley	3,800 0 0
Cordingley & Stopford	3,760 0 0
Shaw	3,759 11 0
Rome	3,754 0 0
Johnson	3,749 0 0
Robinson & Son	3,700 0 0
Brown	3,700 0 0
Davison (too late)	3,699 0 0
Union Land and Building Company	3,690 0 0
Connor	3,614 10 0
Harrison	3,573 13 0
Sanders	3,569 0 0
Maben & Fairnington	3,567 0 0
Herd	3,567 0 0
Elms & Evans	3,555 0 0
Whitell	3,553 0 0
Foreman & Todd	3,480 0 0
Webster (accepted conditionally)	3,400 0 0
Haynes	3,375 0 0
Napier	3,360 0 0

For alterations to the mansion, Ware Park, Hertfordshire, for Captain Parker, R.N. Messrs. Fowler & Hill, architects. Quantities by Messrs. Fowler & Hugman:—

Conder	£8,433 0 0
Scrivener	8,380 0 0
Nightingale	8,283 0 0
Manley	8,237 0 0
Roberts	7,643 0 0
Wagner	7,450 0 0
Woatner, Smith, & Son	7,349 0 0
Hook & Oldrey	6,995 0 0
Kirk & Randall	6,940 0 0

For the erection of villa residence, coach-house, stabling, &c., Egremont, Cheshire. Mr. W. H. Stead, architect. Quantities supplied:—

Johnson	£1,885 0 0
Clark	1,855 10 0
Hudson (accepted)	1,812 10 0
Williams	1,795 15 0

For completing additions and repairs at 50, Hamilton-terrace, St. John's Wood, for Mr. J. Fair. Mr. Thomas Harris, architect:—

Hobson	£1,146 0 0
Salmon	1,111 0 0
Watson Bros. (accepted)	1,070 13 0
Maccormody	936 0 0

For repairs and decorations at Long's Hotel, Bond-street. Mr. Thomas Harris, architect:—

Salmon	£568 0 0
Watson Bros.	489 0 0
Boothby	405 0 0
Hall	320 0 0

For new shop front and various alterations at 122, High Holborn. Mr. G. H. Elphick, architect:—

Watson Bros.	£379 0 0
Croaker Bros.	363 0 0
Drew	342 0 0

For new roads, sewers, and surface water drains, for the British Land Company (Limited), on their Estate at Leyton. Mr. Henry B. Michell, surveyor:—

	Contract 1.	Contract 2.
Dunmore	£5,139	£1,070
Crockett	4,231	774
Killingback	3,795	756
Acock	3,780	855
Blackmore	3,685	705
Thompson & Son	3,630	670
Keeble	3,625	738
Harris	3,580	645
Pizzey	3,471	659
Jackson (accepted)	3,290	600

For alterations, &c., at the George and Dragon, St. John-street, Clerkenwell, for Mr. Pierrpont. Mr. H. J. Newton, architect:—

Martin	£665 10 0
Blundell	582 0 0
Lamble	483 0 0
Taylor	465 0 0
Godden (accepted)	457 0 0
Grimwood (too late)	437 0 0

For alterations and additions to the "Pack Horse," Turnham Green, for Messrs. Fuller, Smith, & Turner. Mr. G. More, architect:—

Adamson & Son	£933 0 0
Hunt	813 0 0
Nye	762 0 0
Lamble (accepted)	747 0 0

For the erection of a house at Cambridge. Mr. W. C. Marshall, architect:—

Seymour	£4,450 0 0
Parnell	4,140 0 0
Hearn	4,045 0 0
Foster	3,600 0 0
Bell	3,476 0 0

For mill and packing-rooms at West Ferry-road, Millwall, for Mr. J. T. Morton. Mr. Wm. Eve, architect:—

Abraham	£1,867 0 0
Hunt	1,814 0 0
Heiser	1,797 0 0
Limn	1,776 0 0
Sheffield & Prebble	1,687 0 0
Salt	1,670 0 0
Harris & Wardrop	1,635 0 0
Crabb (accepted)	1,573 0 0

For chimney-shaft, West Ferry-road, Millwall, for Mr. J. T. Morton. Mr. Wm. Eve, architect:—

Heiser	£580 0 0
Harris & Wardrop	549 0 0
Abraham	530 0 0
Salt	510 0 0
Limn	490 0 0
Hunt	422 0 0
Neil	414 0 0
Sheffield & Prebble	384 0 0
Crabb (accepted)	345 0 0

For alterations at 173, High-street, Stoke Newington, for Mr. Musson. Mr. Wm. Eve, architect:—

Hicks (accepted)	£351 0 0

For alterations to the Albany Tavern, Great Portland-street. Mr. Charles J. Shoppee, architect:—

Green & King	£1,390 0 0

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